

# The AUTOMOBILE

## The 1914 Car—A Step Ahead

**American Product Costs Less Than Last Year  
and Is Better Equipped—Big Trend Towards Six  
Cylinders—Electric Starting Practically Universal**

**O**NE hundred and forty-five American automobile manufacturers are putting cars upon the market this year. The chassis models produced number 242, giving to each maker an average of 1.67 models. More than 45 per cent. of all the makers are marketing but one chassis model, upon which are generally mounted different body types. The greatest number of chassis produced by any maker is six.

### Fewer Chassis Models

The necessity for standardized manufacture to produce the car to sell at the lowest price has resulted in a decrease in the number of chassis models for 1913, which is 339, as compared with 366 in 1912. This decrease would be much greater were it not for the dozen or more new concerns which have entered the field within the last 12 months with one or more chassis.

### Standardization and Quantity

Without exception the large-quantity producers are those who adhere to the single-model principle. Ford, Overland, Studebaker, Buick, Cadillac, etc., are examples, and others in the quantity class are the manufacturers who are concentrating more intensely than the others. Here the use of the

### 1913 Development Extracts 1914

339	Number of chassis models.....	242
\$2508	Average prices of cars .....	\$2347
33.17	Mean horsepower rating.....	31.98
41.24	Horsepower rating of sixes.....	38.3
56.5%	L-head cylinder castings .....	61.7%
28.4	T-head cylinder castings.....	28.4
10.1	Cylinders with valves in head....	6.6
1	Motors with non-poppet valves....	2.9
18.5	Six cylinders cast in block.....	30.1
26.6	Six cylinders cast in threes.....	34.3
46.5	Six cylinders cast in pairs.....	32.9
9.4	Six cylinders cast singly.....	2.7
38	Four cylinders cast in block.....	49.5
48	Four cylinders cast in pairs.....	44.3
14	Four cylinders cast singly.....	6.2
47	Electric self-starters .....	70.5
8.9	Pneumatic self-starters .....	4.7
7.2	Water-cooling with pump.....	72.8
22	Water-cooling by thermo-syphon...	24.7
6.2	Air-cooling systems.....	2.5
52.4	Multiple-disk clutches fitted.....	51.7
44.5	Cone clutches fitted.....	42.2
4	Band clutches fitted.....	6.1
33.7	Gearboxes in unit with motor.....	46.8
45.8	Gearboxes located amidships.....	36.7
21	Gearboxes on rear axle.....	16.7
95.5	Shaft drive through bevel gear.....	96.2
4.7	All types of chain drive.....	3
2	Shaft drive through worm gear.....	.75
33.3	Steering wheels on the left.....	67
43.8	Gasoline fed by pressure.....	39.8
22.4	Four-speed gearboxes .....	29.3
72.2	Three-speed gearboxes .....	67
2.6	Two-speed gearboxes .....	2.1
2.6	Friction transmission .....	1.6
35.4	Mean tire diameter across wheel ..	34.6

highly-trained machinist in turning out thousands of parts of exactly the same dimensions results in cutting the cost of each part and in the assembly work the same result is obtained.

### Purchaser Profits

The net result to the purchaser of all this specialization is that to-day he obtains for less money a better car than has ever been produced before. The average car for 1914 costs \$2,347. For 1913 the average car cost \$2,508. The car for 1914 is better and more fully equipped, it is more silent, economical and of better appearance, and the reasons for this may be found in a careful review of industry, taking up the car part by part. This slight decrease in the value of the average car is conspicuous in that the 1913 car showed a higher average than did the 1912 one, so that 1914 witnesses the swinging of the pendulum in the opposite direction.

### Fewer Low-Priced Makes

Although the average price of the American car is less to-day than it was a year ago, there are fewer makers in the low-priced car field, the reason being that prices have gradually contracted towards the \$2,500 mark, those making



## PRICE

The average price of the American car is now \$2,347, as against \$2,585 for last year, and \$2,508 for the year before. The tendency is to converge around the twenty-five hundred dollar mark, the higher-priced cars coming down and the cheap ones going up. Notwithstanding the drop in price, the average car of today is quieter, easier to handle, more luxuriously appointed and more completely equipped

cheapers cars having the scale and many of makers having come in the \$2,500 class.

whereas in the \$1,500 class there are forty-seven, in the \$1,000 class thirty-three and in the \$4,000 class forty-three. Last year there were just as many in the \$1,500 as in the \$2,500 class, each numbering seventy-nine makers. This is due in large measure to the fact that very many of the so-called low-price-car builders have added a six of medium price, which helps to swell the medium price list without adding to the number in the \$1,000 field. It is further due to the fact that in many cases where two or three 1913 models have been superseded by one 1914 model, the latter is largely a compromise of the former models, frequently with larger motor and generally more complete equipment.

In the matter of choice the purchaser has as wide a field from which to select as ever, notwithstanding the fact that the number of models is fewer than in the past 2 years. The field is well balanced due to the tendency of those who have dropped two models to make another model which is a happy medium between the two discontinued and which, while performing the work of the larger model, costs but little more than the smaller one of the previous year. A notable example of this is

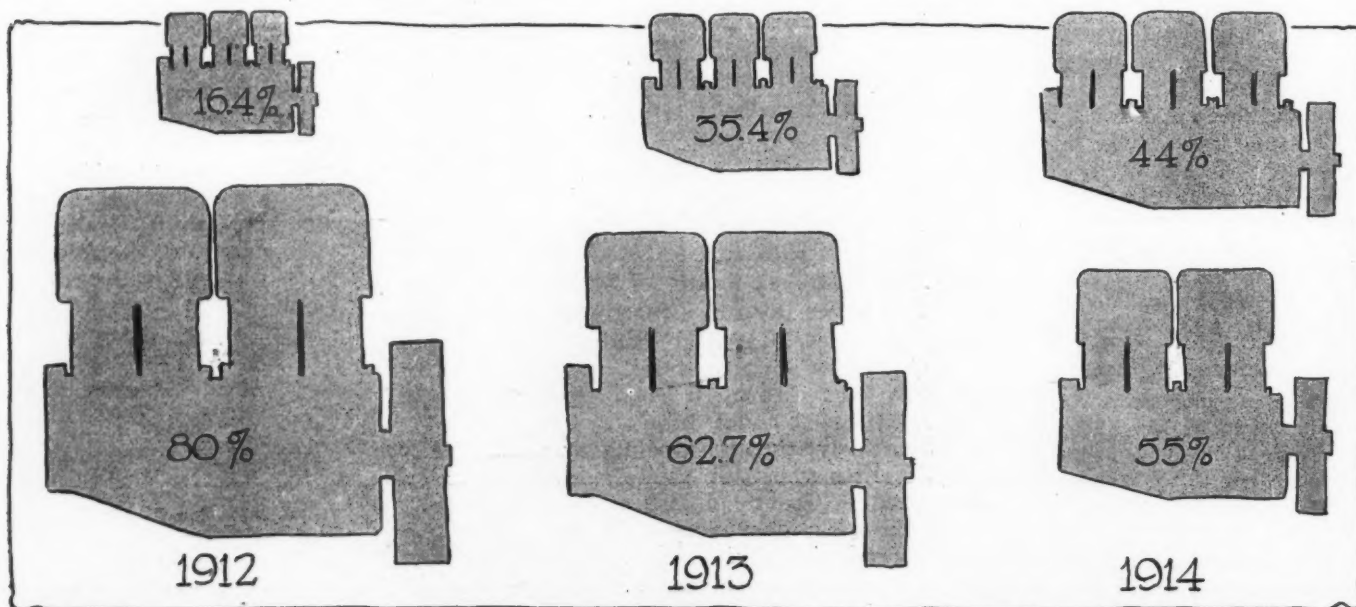
gradually ascended the high-priced madown, so that now there are fifty-nine

Overland, which for 1913 sold two models, one having a 4 by 4.5 motor and the other a 4.38 by 5.5, whereas this year a single model having the medium dimensions of 4.125 by 4.5 is marketed. The prices last year were \$985 and \$1,475. This year the intermediate model equipped with electric lighting and cranking lists at \$1,075. Nineteen firms have followed the tendency to cut the number of models and only five have added to their number of models. In the latter instance it will be found that in nearly every case the increase has been due to the addition of a small six-cylinder car. This is true of the Marmon, which now makes three instead of two models; Pullman, which is sold in four instead of three, and Palmer and Singer, which has not only added a light six but two slide-valve sixes.

Case, building only four-cylinder models, has three for 1914, as compared with two last year.

The firms which are making fewer models this year than last include: Auburn, Austin, Cole, Franklin, Glide, Hupp, King, Kissel, Locomobile, McFarlan, Moon, Norwalk, Oakland, Overland, Packard, Peerless, Regal, S. G. V. and Studebaker.

Of these Franklin has made the biggest cut, dropping from five models to one. Another firm which made a big reduction is Studebaker, which cut from five to two. In making the cut Franklin dropped from five chassis having different wheelbases and three different power plants, one a four and the other two



This year 44 per cent. of the cars are equipped with six-cylinder motors and 55 per cent. with four-cylinder ones, or, in other words, the ratio between the two is nearly 1 to 1. Last year there was about one six to every two fours, while the year before only one car in five was equipped with a six-cylinder engine



sixes to a single six, with a single wheelbase, on which all types of body are fitted. Studebaker in cutting from five to two models, dropped from four fours and a six to one four and a six. The four makes a happy medium between the fours of last year.

Studebaker has further standardized and simplified production by having one cylinder size of 3.5 by 5 inches for both four and six of this year.

Another reason for the reduction in the number of models by concerns which have formerly made fours and sixes is that five have dropped the fours and concentrated solely on sixes. In this class are two of the highest-priced cars on the American market, Peerless and Locomobile. The other firms which have dropped fours are Franklin, Hudson and Chalmers.

With this gradual dropping of fours among the well-known manufacturers to meet the demand for sixes, the number of manufacturers of sixes only is now thirty-four. Of this number there are nineteen entrants to the six field this year. These include many well-known concerns, such as Abbott, Apperson (who has started with two), Buick, Henderson, Marion, National, Jeffery, Pathfinder, Velie and Richmond. Besides those who have previously been manufacturing sixes, are many new arrivals, among these being Chandler, DeSoto and Lewis.

In spite of the general rush toward sixes there are many firms in the big-production class, which have not as yet entered this field. These makers of fours exclusively number fifty-five and constitute the largest factor in the industry, as the makers of both fours and sixes number but forty. In the big-production class Ford, Overland, Cadillac, Hupp and Reo stand out as makers who concentrate on the four-cylinder car.

It is interesting to note that in the cars which have not made a single change in the cylinder dimensions as used last year and this year that the two extremes seem to meet. The small-output concerns and the large-output ones are both to be found in this list. Cadillac continues with the same motor; so do Ford, Fiat, Reo, White, Mercer, Jackson, Cunningham, Dorris, Knox, Marathon, Metz, Paige, Pierce-Arrow, Peerless, Pilot, Speedwell and Stearns.

#### Motor Smaller This Year

The average motor is smaller this year than it was last. The respective horsepower ratings of the average motor for 1914 and 1913 are 31.98 and 33.17, but taking into account the increase in the percentage of sixes the reduction of the bore is larger

### HORSEPOWER

1912 - 33.43

1913 - 33.19

1914 - 31.98

The motor horsepower has been steadily decreasing; this year the average rating is 31.98, as compared with 33.19 for 1913 and 33.43 for 1912. The decline is caused by the tendency to manufacture higher-speed motors and to the increasing popularity of the small-bore six-cylinder engine

than would appear from the horsepower ratings charted above.

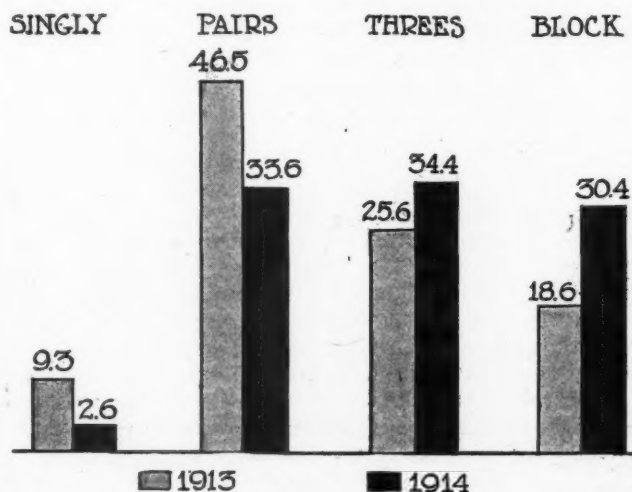
The horsepower of the average American six for 1912 was 45.77, for 1913 41.24, and for this year it is 38.3.

The average horsepower of the English six-cylinder car is 36, showing that, allowing for the poorer American roads and the heavier duties put upon the motor, the tendency of design is approaching that of Europe in the development of the small six-cylinder car.

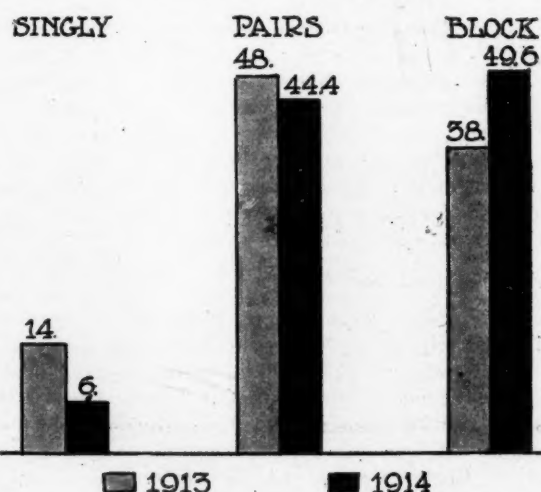
#### Tendency Is to Combine Cylinders

In the six as well as in the four-cylinder the tendency towards combining the cylinders is growing. Block fours are more numerous, and, considering both fours and sixes together, 37.7 per cent. of all the motors have their cylinders cast together. Casting in pairs is the only practice which leads this, claiming for its share 42 per cent. of all the motors made in this country. Of the six-cylinder cars 33 per cent. have the cylinders cast in threes, the reason for which is two-fold; first in the factory handling, a block of three-cylinders is well within the strength of one man, and secondly in the repair work, it is believed by some to be an easier proposition for the average repairman to tackle. The clean exterior of the block casting and the reduction in machining and factory costs have more than

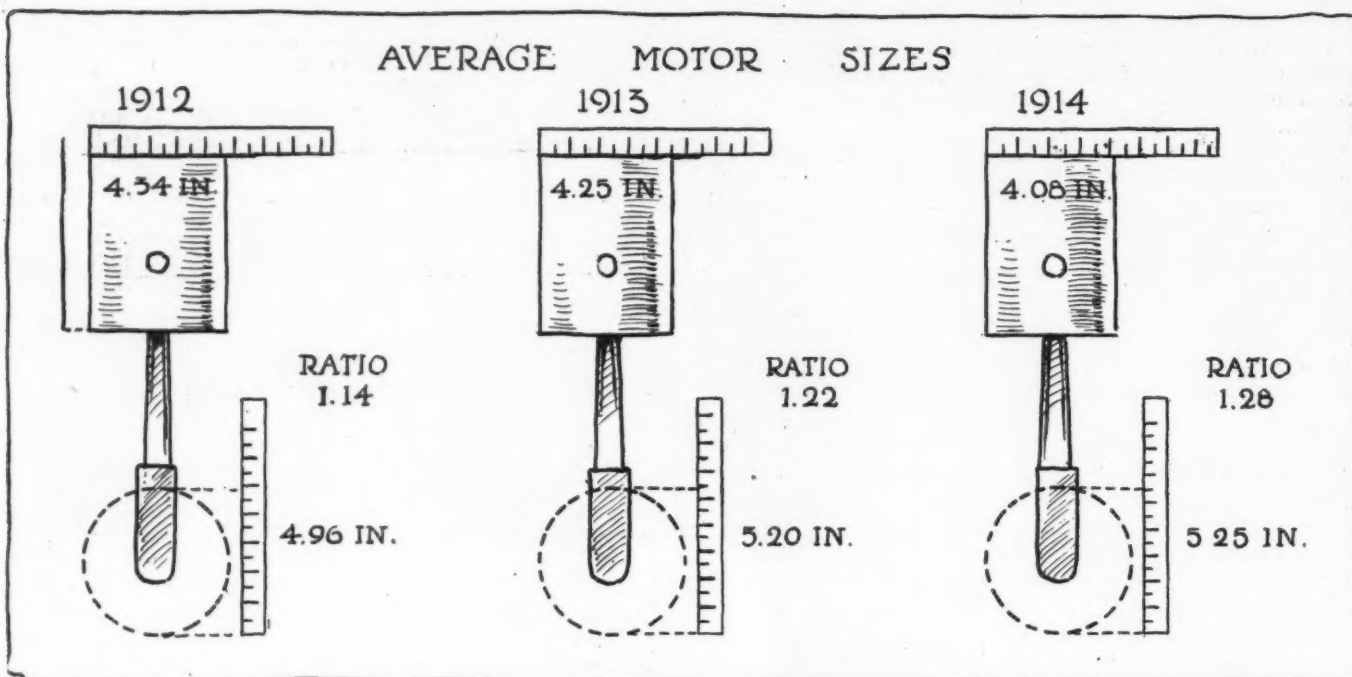
### SIXES-HOW CAST



### FOURS-HOW CAST



In both fours and sixes casting singly and in pairs has decreased, while casting in a single block has gone up. The above chart shows at a glance how each method of casting has progressed during the past year. Another development which of course applies to sixes only is the increase in casting in threes. A block of six cylinders is believed by some manufacturers to be too large because it takes more than one man to handle it on its way through the factory. Nevertheless there is an increase of 12 per cent. in this method of casting during the last year, an increase which more than equals the increase in block fours.



The American car for 1914 has a smaller bore and longer stroke than its predecessors of 1913 and 1912. Stroke-bore ratio has been increasing uniformly during the past 3 years and for 1912, 1913 and 1914 has gone through the progressive steps of 1.14, 1.22 and 1.28 as average ratios. The average bores for 1912, 1913 and 1914 are 4.34, 4.25 and 4.08 inches, respectively, showing a steady decrease, while the strokes have tended to lengthen for the 3 years through the progressive steps of 4.96, 5.20 and 5.25 inches. There is no doubt that the introduction of a number of small sixes has had something to do with the decrease in average bore, as the four has not shown the tendency to decrease in size to the extent that may be observed in the case of the six.

offset the extra foundry expense in the estimations of many, and the tendency towards block castings continues to grow. In 1913 there were but 28 per cent. of the models on the market using the block casting, showing a growth of 9 per cent. for this practice in the past year.

The L-head cylinder still remains more popular than any other type. At the present there are 146 L-head motors listed, making a total of 61.7 per cent. of the field. Last year the L-head comprised 56.5 per cent. of the field and in 1912 55.7 per cent.

The T-head design follows next for 1914, with sixty-six representatives, giving a percentage of 28.4. In 1913 it was 28.4 per cent. and in 1912 it was 31.8 per cent.

The valve-in-head design for 1914 is used on sixteen cars, which is 6.6 per cent. For 1913 it was 10.1 per cent.

#### Non-Poppet Types Gain

The non-poppet motor has added recruits during the past year. Moline, Willys and Lyons-Knight have adopted the Knight engine, while Palmer and Singer has announced two six-cylinder chassis, incorporating the Fischer slide-valve motor. The Edwards-Knight, which came out a year ago, has been absorbed by the Willys interests and will be made at Elyria hereafter as the Willys-Knight. This makes 2.9 per cent. using the non-poppet types for this year. There were in 1913 about 1 per cent. using other than the poppet designs.

#### Eliminating the Noise

Passing on to the working parts of the motor, the 1914 design has lighter reciprocating parts than any of its predecessors, but heavier rotating parts. There has been a marked tendency to lighten the pistons and the connecting rods. The use of fewer rings is a growing tendency, and these are put nearer the top of the piston. Mercer uses but two rings and has found this satisfactory. Chalmers is an example of big weight reduction in pistons and connecting rods. All Continental motors have the weight of these parts greatly reduced. A finer balance of reciprocating parts and crankshafts has been generally accomplished, which has been brought about by the demand for greater silence, this being obtained by the reduction in vibration consequent upon lighter weights and improved balance.

Crankshafts are stronger and have somewhat longer bearings. The rear main bearing has been increased in many cars to take care of the extra thrust of the flywheel cranking motor. The use of ball-bearing installations for crankshafts has not increased, although there are unquestionably a number of arguments in favor of such design. Bearings of this type are apt to get noisy, and the present cry for extreme silence would at once taboo them on this account. But such objections are overcome by good design. Several cases are of note wherein ball bearings are still adhered to for this important part of the engine. The White, Detroit, Kline and Day still use them with good results. Metropal has abandoned the ball-bearing shaft for one with plain bearings.

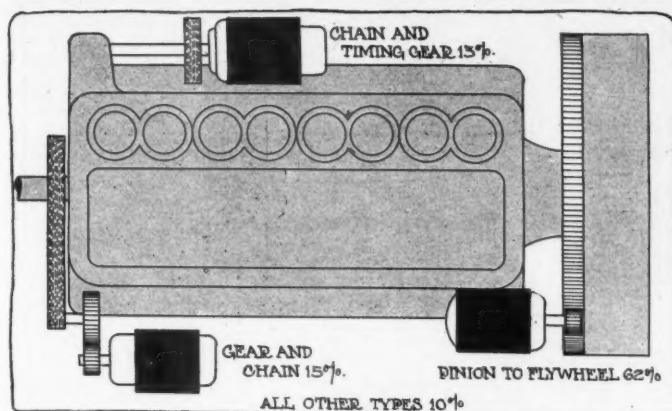
Valves are larger and the 2-inch type is becoming more common. The use of Tungsten steel for the valve to eliminate the necessity of repeated grinding is finding favor. The inclosed valve mechanism, which has shown such good results in the past 2 years, has grown rapidly, and now 75 per cent. of the cars have their valve mechanism housed by a cover plate. Taken into consideration with the block casting, a neat exterior is developed.

There is a tendency for even the overhead-valve concerns to house this part of the motor, and as examples of this may be mentioned Franklin, Partin-Palmer, Chevrolet and the new Premier. Franklin has adopted a compensating device on the overhead mechanism which keeps the valves silent. Owing to left drive many have shifted the valves to the right side of the motor.

Ninety per cent. of the American makers use a combined pressure and splash feed oiling system. In this the oil is fed under pressure to the main bearings, whence it flows to splash troughs, from which the splash of the connecting rods takes care of the remainder of the lubrication. The oil reservoir is in the crankcase on 95 per cent. of all the cars.

There is a slight tendency towards pressure feed. In the new Moline-Knight oil is carried by pressure to all bearing parts, and there is no splash by the connecting rods. The looked-for interconnection of oil feed with throttle has not materialized with as great force as was anticipated, yet it has not fallen by the wayside, those concerns using it in 1913 continuing it with greater perfection for this year. Dash sight feeds are gradually losing





Diagrammatic view of the starter installations of the year. The type which is geared to the flywheel is far ahead of all others and covers 62 per cent. of the field. Next comes the gear and chain installation, which has about 15 per cent. Very closely following the gear and chain installation is the chain and timing gear one, which is used in 13 per cent. of the cars fitted with starters. The most important fact in connection with the starter development of the year is that the method of mounting has improved 100 per cent. since last show season.

ground, the perfected pressure systems making them unnecessary and the greater refinement of instrument boards dictates their withdrawal. Convenient oil reservoir indicators have made commendable progress, as have improved breather pipe and readily operated drain cocks.

Much effort has been expended in keeping the oil temperature in the crankcase as low as possible, which is accomplished either by ribbing the exterior of the oil reservoir and crankcase base or by eliminating the mud pan beneath the motor and using fitch plates between the motor and frame instead.

Thermo-syphon cooling showed a marked tendency to increase last year, and this year it has gained again 2.7 per cent. The figures for 1914, 1913 and 1912 for thermo-syphon cooling are 24.7 per cent., 22 per cent. and 20.8 per cent. Pump circulation has also gained slightly and is now used on 72.8 per cent., whereas last year it was used on 72 per cent. Both thermo-syphon and pump circulation have gained at the expense of the air cooling, which has fallen from 6.3 per cent. in 1913 to 2.5 per cent. in 1914. One of the cars which is noteworthy in this direction is the Cameron, which heretofore was an air-cooled car and which now uses a thermo-syphon system. Franklin, Duryea and Zimmerman, in one model, use air cooling.

In the waterjacket work there is a tendency to make the jacket spaces larger and also to make the top, in the case of a block cylinder, detachable. With thermo-syphon cooling there is a marked tendency to make the entire manifold and water-jacket head in one casting. The waterjacketing is now carried around the intake and exhaust manifolds more than ever before. Packard this year jackets the manifolds and claims a gain in

power by so doing. This follows the tendency of improving the carburetion of heavier fuels.

Pressure gasoline feed is now used on 39.8 per cent. of the chassis. Last year it was used on 43.8 per cent. The slight difference is due to a tendency on the part of some of the makers to instal the tank under the cowl furnishing a direct gravity feed of good head to the carburetor, which can be kept high.

There are 1.7 per cent. of the makers now using a combined pressure and gravity feed. In this the gasoline is pumped from the pressure tank generally at the rear of the chassis to a gravity tank, which may be under the cowl.

#### Tanks Under Cowl

The positions of the tanks for 1914 is divided as follows: 45.3 per cent. under the front seat, 32 per cent. in the rear and 12.7 per cent. under the cowl.

Ignition by single magneto system is on the increase. This year 22.8 per cent. of the makers are using that type of ignition. The dual system leads with 59.4 per cent., but we are tending toward European practice in this.

In the \$2,500 car class, in which there are more cars listed than any other, 33 per cent. are fitted with single ignition. Last year but 10 per cent. had this type of ignition.

Dual ignition in this class has dropped from 72 per cent. in 1913 to 57 per cent. in 1914.

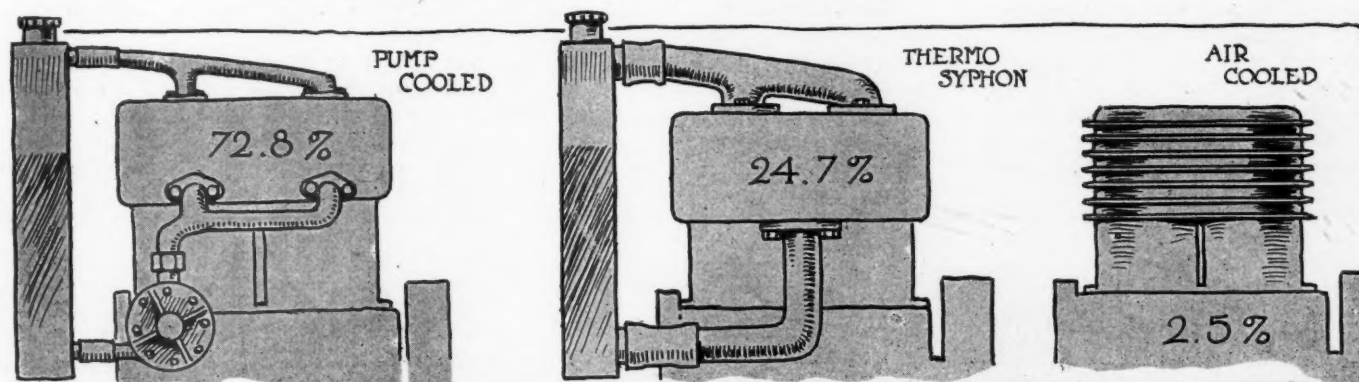
Double ignition has also fallen off 7 per cent. in the last year in the same class, as it is now 8 per cent., as against 15 per cent. a year ago. Even in the \$4,000 class, where the most expensive type of ignition could be expected, the single system has gained favor, now being used on 15 per cent. of the cars, whereas last year it was on 12 per cent.

#### Cranking Motors Improved

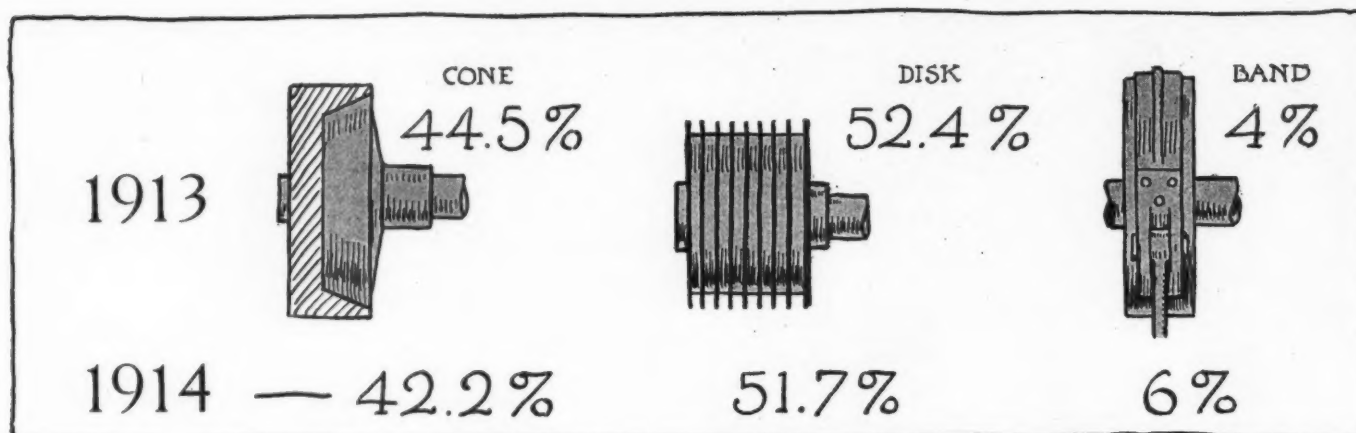
Of 225 models equipped with electric cranking on the market this year, 212 have electric mechanism for this duty, seven have air and three other types. Last year at this time the starter situation was chaotic, and the entire industry was in a state of change, due to the rapid fitting of cars for the show with starters of any type they could secure. This year the installations are carefully thought out and a well-defined policy in regard to the electric starter has ensued.

The predominating thought in the minds of the engineers has been to so mount the cranking motor that it may gear to the flywheel, 62 per cent. being cranked in this manner. The most of these use a reduction gearing between the motor and engine flywheel, while one maker at least drives with one gear reduction only.

The other installations show 15 per cent. driving through a gear and silent chain combination to the crankshaft at the front end; 13 per cent. through chain direct to the timing gears, and 10 per cent. employing other methods of drive. A few makers are fitting the cranking motor to the transmission system in the rear of the engine.



The cars for 1914 are in 72.8 per cent. of the models on the market cooled by water which is circulated by pump. Thermo-syphon cooling is next in favor, being used on 24.7 per cent. of the cars. Air-cooled cars are far in the minority, and but 2.5 per cent. of the makers are now using that type of car.



America likes the disk clutch more than any other. The disk classification is of course a broad one and covers the true multiple disk type all the way down to the three-disk variety. If distinct types alone were considered there is hardly any doubt that the cone would lead, as it is used in 42.2 per cent. of all the 1914 cars. Taking the disk clutch as a class, it leads with 51.7 per cent. The devotees of the band clutch still adhere to this, and in 1914 6 per cent. are using them, a gain of 2 per cent. over last year. In 1913 the relative status of the cone and disk clutches was very much the same as it is for 1914.

Improvements in cranking motor control are very pronounced and make for greater simplicity. An example of this is where an added position has been given the speed change lever so that additional control parts are not needed for the starter. Still another improved control is that of the short lever conveniently mounted adjacent to the speed change lever. Others have placed the starter control on the instrument board, where it is as accessible as the switch. Some have positioned the control on the steering column.

The year has witnessed commendable improvements in starting motors by weight reduction, this amounting to 20 or more pounds in many cases. The unnecessary corners have been chopped off and the exterior lines so modified that the starter mechanism now looks an integral portion of the engine rather than an excrescence.

In a word, the story of starter progress during the last 12 months has been one of improving designing to give a higher efficiency rather than basic changes in design. Refinement is also evidenced in the provision now made in nearly all equipments, so that there are no moving starter driving parts once the starter has performed its function.

#### Electric Lighting in the Van

Electric lighting has appealed very strongly to the automobile buyer during the past year and now 89 per cent. of all the cars are fitted with it. Acetylene lighting for the headlights is used on the remaining 11 per cent. Electric lighting last year was used on about 50 per cent. of the cars and in many instances those using electric light did not equip with a generator but merely used a storage battery. Even cars selling for \$900 now have an electric generator and battery lighting outfit.

Electric generators have undergone as much refinement during the last 12 months as have the starting motors. Designers have aimed to develop a generator that will deliver enough current at relatively low motor speeds to not only carry the lamp load but take care of the starting duty and charge the battery in addition. An electric generator to be a success must be capable of successful operation in heavy city traffic in the winter season when the chassis carries a heavier body, has a

larger lamp equipment and travels at low speeds. To accomplish this the electrical engineer has had to develop a generator capable of delivering a larger ampere output at relatively low speeds combined with a regulator that will take care of the larger output with higher speeds. This has led to some careful work in many factories in order that the lighting outfit will measure up with the heavy work of the winter season. Some instruments show a large current output at speeds of 8 miles per hour with their maximum output at speeds not over 15 miles per hour.

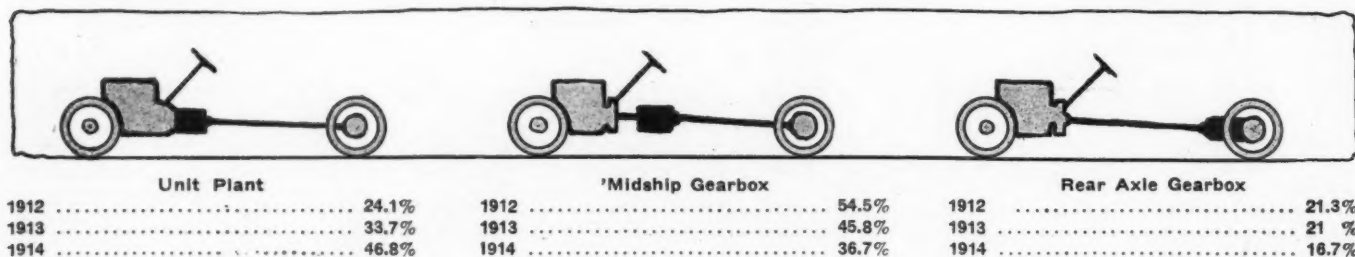
#### Starting Motor Developed

Much of this progress is due to concentration by electrical concerns that have specialized on this work, only two or three of the car building companies manufacturing their own electric cranking and generating equipment. The making of these starting and lighting units is today considered as permanent a part of the motor industry as the manufacture of magnetos or carbureters.

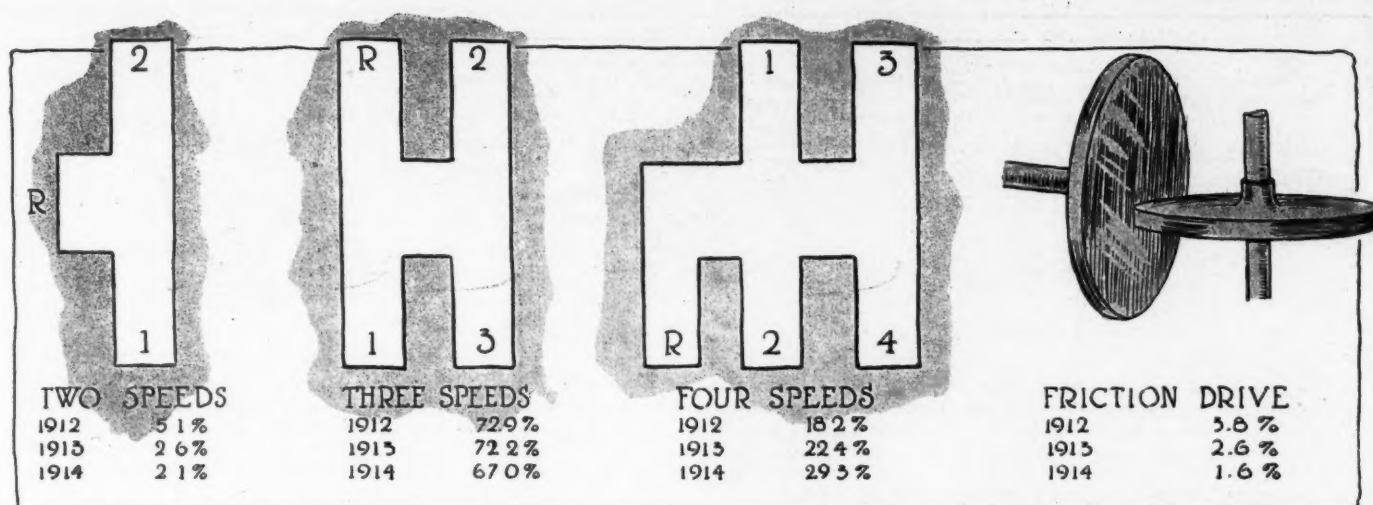
One development of the year is the yoking together of both cranking and generating units into what is familiarly known as the tandem or double-deck design, in which a common housing contains the separate armatures of both motor and generator. The number of concerns using a common armature for the motor and generator remains as it was a year ago, the much-mooted controversy of combined-armature machines vs. single-armature types not having yet entered the final stages of solution.

Where the generator is a separate unit it is customary to gear it direct to the engine, so that it operates all the time the engine is running. There are a few examples of silent chain drive, but it is in the minority compared with gear drive. In the next issue of THE AUTOMOBILE electric cranking and lighting will be treated exhaustively in separate articles.

The fitting of power tire pumps has come in for much consideration by designers of the perfected car of today. Not a few makers have included such an instrument as an integral part of the motor assembly. Several installations are to be found where the power pump occupies a prominent position along with the







Every year shows an increase in popularity for the four-speed gearset. This year the installations are on 29.3 per cent. of all the makes, whereas last year but 22.4 per cent. of the American cars had gearboxes affording the four forward speeds. In 1912 the percentage was still less, 18.2 per cent. The increase in numbers of the four-speed gearset is due to the fact that it is gaining recruits from two-speed and three-speed gearsets, as well as from friction drive. The three-speed gearset has shown a falling off in percentage for the past 2 years. Between 1912 and 1913 the drop was from 72.9 to 72.2 per cent., and from 1913 to 1914 it was 5.2 per cent. The two-speed gearbox also shows that the little cars are beginning to have three-speed gearboxes and the number of two-speed cars is distinctly less in proportion as compared to 2 years ago.

water pump and electric generator, being driven from the same shaft which is common to all three. In these cases it assumes nearly as much importance as do the other accessories which are now regarded as standard. In other cases, makers have made provision for the mounting of such power pumps, even though they do not supply them as a part of the car's standard equipment. With these designs the owner can buy any standard tire pump and fit it to his engine at any time that he decides the work of pumping tires by hand to be too arduous labor for him. Some examples of attaching tire pumps to other driving points save those afforded by the engine are found. That is, the transmission has been utilized, but this is often questionable practice due to the lesser accessibility of such location. Nearly every pump installation makes use of gears and has a shifter mechanism whereby the pump gear is made to engage with its driving gear whenever it is to inflate a tire.

#### Clutches Divide the Field

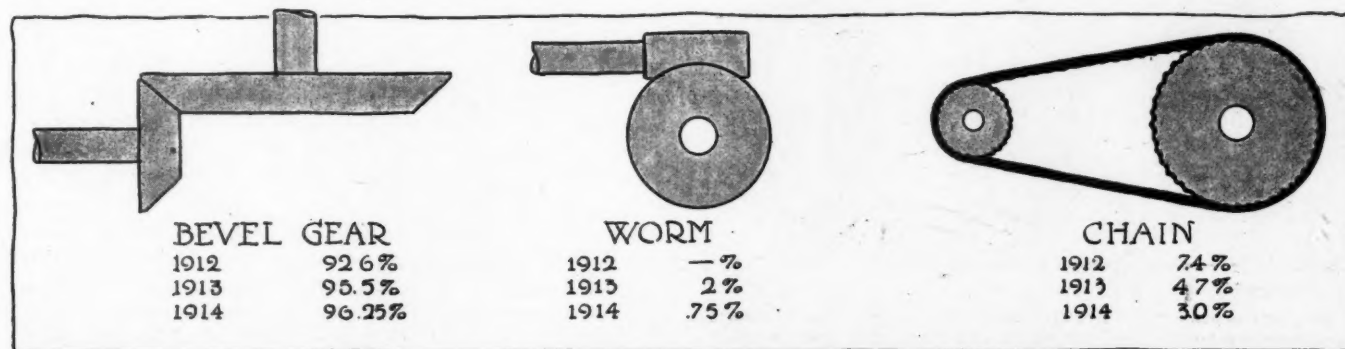
The disk clutch is still more popular than any other in America. For 1914 it leads with a following of 51.7 per cent. of all the makers, which is a very slight drop from last year, when 52.4 per cent. were in favor of it and used it on their cars. Next, of course, is the cone clutch, which for this year claims a percentage of 42.2, while last year 44.5 per cent. used the cone. The band clutches, including the contracting and expanding, are used on 6.1 per cent. Concerns such as Peerless, Haynes, Chadwick and Apperson, which have favored this type, continue them.

Two big questions regarding the gearbox confront the engineer today. First is the question of location. There has been a tendency toward the unit power plant coupled with three-point suspension in which the motor, clutch and gearbox are housed together and then suspended at three points to render the engine free from any strains due to the warping of the frame. The second question is the number of speeds to be used.

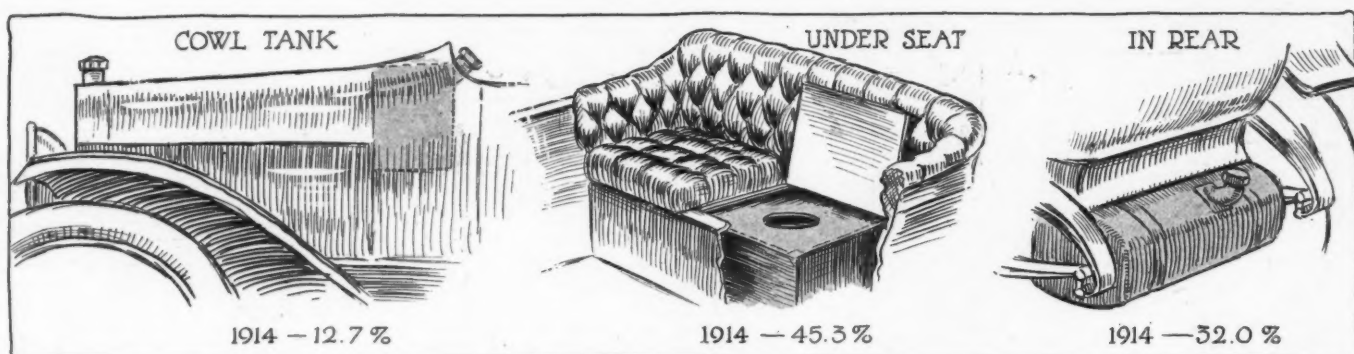
Regarding the question of location there is an undoubted trend towards putting the gearbox, clutch and crankcase in a unit. This year 46.8 per cent. of all the cars are so built. This is an increase over last year, when 33.7 per cent. used this design. In other words, from being the last choice of the makers in 1911, when only 15.6 per cent. fitted the unit plant, it has become the first choice now.

The second in the matter of location is the amidships position. In 1912 54.5 per cent. fitted the central gearboxes, in 1913, 45.8 per cent., and in 1914, 36.7 per cent. This steady decline has all been taken up by the growth of the unit power plant. Some of the largest makers have changed over from the amidships to the unit position.

A percentage uses the rear-axle type. In 1912, 21.3 per cent. had this location. In 1913 the percentage was 21, and this year it is 16.7. These differences are small compared to the large rush to join the forces of unit construction. Some of the concerns which have shifted from other positions to a unit with the motor are Apperson, Austin (on one model), Haynes and Premier. This shift has generally come with an entire change



The worm drive has not taken the grip on America that it has on Europe, especially in Great Britain. There, there is a decrease in percentage of cars using this type of drive as compared to a distinct drop on this side of the water. Chain drive is decreasing, and the deserters from the ranks of these two classes of drives are swelling the list of recruits to the bevel type. The bevel is far in the lead for this year, having 96.25 per cent. of the total installations to its credit. Chain drive has dropped from 47 to 30 per cent. in the last year owing to the tendency of certain makers to put shaft drive on their light models.



The cowl gasoline tank which was introduced last year for the first time has met with favor, and the season of 1914 finds 12.7 per cent. of the cars on the market fitted with tanks of this description. The rear tank is also increasing owing to the tendency towards pressure feed. The latter is no doubt induced to a large extent by the desire to have the carburetor mounted as high as possible on the side of the motor, and also to shorten the length of the intake manifold in order to allow of a minimum condensation of the low grade fuels now in common use. A short jacketed manifold seems to be the tendency of the times. The under-seat position of the tank still holds the lead in popularity, with 45.3 per cent.

of motor although not necessarily with a change in the fundamentals of the motor design. In shifting the gearbox to the unit location from amidships, it has necessitated other changes in the driving mechanism and there has been as a result a general trend towards the reduction of the number of universal joints. There are many cars now that have a single universal joint in the drive and this is the point at which the shaft takes the drive from the gearbox. This is true both of the cars which have the unit construction and also those that have the gearbox located amidships.

#### Four-Speed Gearboxes Increasing

The four-speed gearbox is on the increase, but it is still far outnumbered by the three-speed one. Considering 239 models of all classes, 157 are equipped with three-speed boxes and 68 with four speeds. Five models have two speeds.

In a review of all makes for 1914 there are 29.3 per cent. using the four-speed gearbox as compared with 22.4 last year and 18.2 the year before. The three-speed percentage has been falling off for the past 3 years: in 1912 it was 72.9; in 1913, 72.2 and in 1914, 67. The two-speed gearbox is also dropping. Last year it was used on 2.6 per cent. and this year it is used on 2.1 per cent. of all the cars. Friction drive is also gradually falling off in percentage. In 1912 it was 3.8 per cent., in 1913, 2.6 per cent. and in 1914 1.6 per cent.

The increase in the four-speed gearbox must be taken in consideration with the decrease in average horsepower in order to determine its full meaning. There are two factors of speed range, or as it has come to be known, flexibility of a car. The first of these is the amount of power at the disposal of the driver

and the second the range of gear reduction. The tendency towards a greater number of gear changes and less power shows that flexibility is beginning to be secured through gear changes rather than through carrying more engine weight than is really necessary. The two-speed axle used by Cadillac and Austin is a further example of gear-ratio flexibility.

There are still two examples of the planetary gearset on the market. These are Ford and Zimmerman. The exponents of friction drive are Cartercar, Lambert and Metz.

Bevel gear final drive is still far in the lead. On the other side of the ocean we see immense strides made in the worm drive, especially on the six-cylinder cars, but the American builder has not taken it up extensively. In fact for 1914 there are fewer worm drives on the market than for 1913, the percentage having dropped from 2 to .75 during the last year.

Chain drive has fallen off during the past 2 years. In 1912, 7.4 per cent. of the American makers used the chain drive. In 1913 the percentage had dropped to 4.7 and this year to 3. The Chadwick and Simplex companies are continuing their chain drives but some of the models of the latter concern are now fitted with the shaft drive.

There has been a big tendency towards the adoption of the floating rear axle this year and makers who previously used the semi-floating types are changing over on their new models.

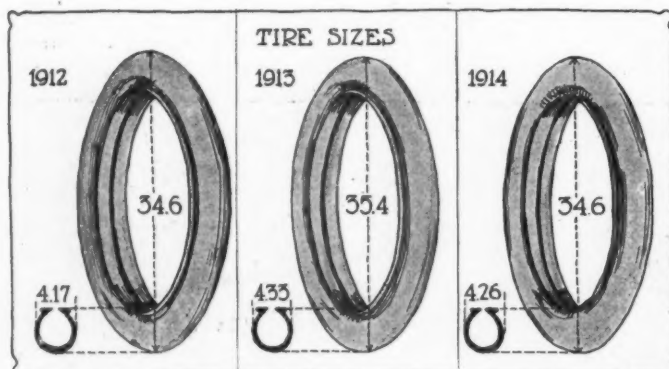
The use of the two sets of brakes on the rear wheels is in the ascendency as it has been for the past few years. The transmission brake is falling off and the general type now in use on the average car is an internal and an external brake operating on a drum bolted to the rear wheel. The electric brake is one of the novelties of the season.

#### The Average Wheelbase Is Shorter

The average chassis is shorter this year than last year. This is due in a large measure to the reduction in size of the six-cylinder cars. The average wheelbase is 121.4 inches this year which is .6 inch shorter than last year, when it was 122 inches. The peak of the length curve seems to have been reached last year as the year before the average chassis length was 118 inches. In the low-price chassis including cars selling in the \$1,000 class, the length increase has been uniform and is this year 107 inches as compared to 103 inches for 1913 and about the same length for 1912.

An avalanche towards left drive and center control has taken place this year, 65.5 per cent. of all the cars on the market being so equipped. The total percentage of cars using left drive is 67, as there is a small percentage, 1.5, using the left drive with left control. In 1913 but 31.6 per cent. used left drive and center control and 1.7 per cent. used left drive and left control.

Right drive with right control was the leader last year as 50 per cent. of all the cars used that method. This year but 22.2 per cent. of the makers are fitting right drive with right con-



Last year the peak of the tire size situation was reached. Tire sizes and wheelbases follow each other closely, and last year marked the car of greatest length. The average tire size for this year is 34.6 by 4.26 inches. For last year it was 35.4 by 4.33. The average wheelbase for this year is 121.4 inches. Last year it was 122 inches. It is interesting to note that the car of 1913 cost more, was longer and had bigger tires than the average car of this year



trol. Right drive with center control has dropped to the extent of 4.9 per cent., as in 1913 there were 16.7 per cent. using it and in 1914 but 11.8 per cent.

There has been a tendency to shorten the throw of the levers and to keep them close to the seats in using the center control, in order that one lap robe can be used for the front seat and so that there will be no danger of knocking against the levers. Locomobile has met this situation by putting the gearshift lever in the central position and putting the emergency brake lever on the left side so the driver sits between the two levers which are both shaped so that they are out of the way and do not interfere when entering or leaving the seats.

The introduction of left drive with center control has made necessary several changes and for that reason it is common to see speedometer drive which has had to be changed and all the other dash instruments mounted on the left side. The necessity of changing the speedometer drive has caused many of the makers to experiment with using a drive from the gearset and many have adopted this. Inclosed speedometer drive within the front wheel spindle is also a worthy novelty.

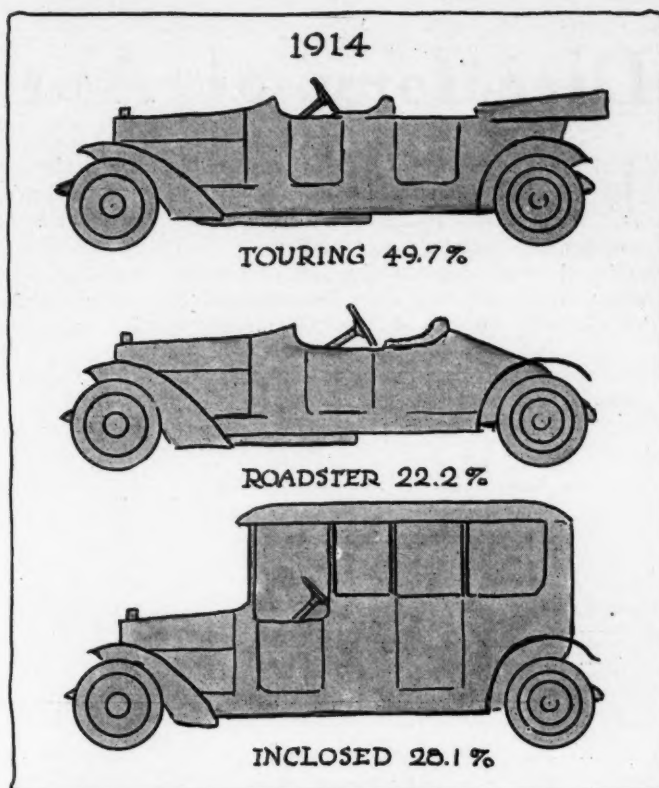
Another tendency which is noticeable in chassis construction is towards deepening the channel members and the increase of the cross bracing. In cars using the unit construction with four-point suspension there has been a tendency to extend the front structure back solid as far as the rear end of the gearbox. This stiffness has been increased by a broad flange on the motor which serves at the same time as a shelf for mounting the starting motor, generator and other accessories. Generally when this solid structure is used the only universal joint in the drive occurs behind the gearbox. In general the chassis structures are braced more firmly than ever before. The use of heavy gusset plates with better rivetting jobs has done much to stiffen the structure.

#### More Complete Equipment for 1914

This year the cars are equipped better than ever before. Demountable rims are fitted with but very few exceptions. When the demountable outfit is supplied with the car it is general practice to furnish another rim without extra charge. Some makers furnish an entire extra wheel where the demountable type of wheel is used.

Improvements in tops have been extensive. It is now common practice to fit a one-man device which can be raised and lowered without leaving the vehicle. The long straps from the front end of the top to the front end of the chassis frame are disappearing and in their place are short straps which fasten to the top of the windshield frame or some other point adjacent to the front compartment where they can be reached by the driver. Side curtains are now in many instances rolled up inside the top or so arranged that they fold up with the top and can be put up from inside the car in case of necessity.

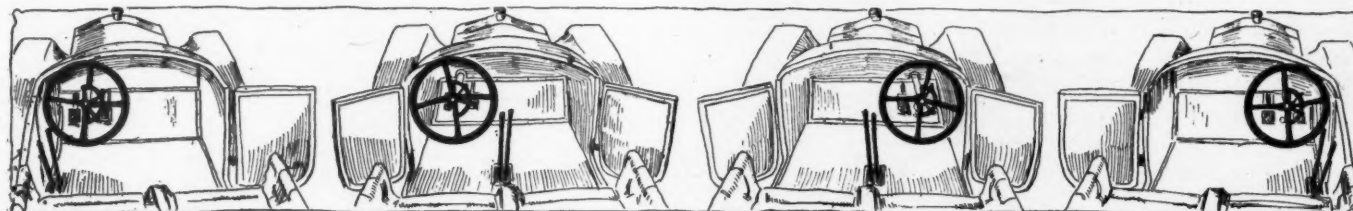
The body work of the American car for 1914 is much better than any of its predecessors. The development of the streamline form has given a much-beautified appearance. In this design there is an unbroken line starting at the top of the radiator and continuing back to the end of the cowl. The cowl line moulds gradually into the line running along the side of the body and at the rear the car presents a rounded appearance which takes away any abrupt lines. The sides are clean due to carrying the tires



Practically half the cars built in America are of the touring type; to be exact, the percentage is 49.7. The inclosed car is gaining in popularity, and the addition of several handsome designs has attracted the buying class very favorably. For the 1914 season 28.1 per cent. of the cars on the market will be inclosed designs. The roadster is not far behind the combined class of all types of closed cars, as it occupies 22.2 per cent. of the attention of the industry. Of the touring car class the five-passenger is far ahead of any of the others, but each year sees a greater number of seven-passenger designs. The big crop of small sixes has carried with it an increase in the seven-passenger line

at the rear. Tool boxes and battery boxes have been removed from the running boards and the fenders in general adhere more closely to the lines of the wheels. The trend towards crowning the fenders slightly has met with great favor. The Hudson company in its new six has carried out the crowned fender idea and the effect has been to give a more solid structure and at the same time to greatly beautify the car. Chalmers uses the crowned fender to great advantage.

The wire wheel is not used as prominently as was predicted for the reason that the car manufacturers have been unable to secure the wheels in sufficient quantities to merit their putting them regularly on all their models. Many cars have them offered as optional at a slightly increased price and a few are offering them as regular equipment. The Stutz company for instance uses them regularly on one of their roadster models. The wood wheel continues to be supreme and in point of size is the same as year before last. The average tire sizes for 1912, 1913 and 1914 are respectively 34.6 by 4.17; 35.4 by 4.33 and 34.6 by 4.26 inches.



Left Drive  
and Left Control  
1913 1.7 Per Cent.  
1914 1.5 Per Cent.

Left Drive  
and Center Control  
31.6 Per Cent.  
65.5 Per Cent.

Right Drive  
and Center Control  
16.7 Per Cent.  
11.8 Per Cent.

Right Drive  
and Right Control  
50.0 Per Cent.  
22.2 Per Cent.

# Directory of Automobile Manufacturers

THE great number of concerns engaged in the manufacture of automobiles at the present time and the diversity of the models call for a table that will not only give the name and address of a maker but for one that will give the chief specifications as well and thus afford a ready means of comparison of the different cars. The accompanying table has been prepared with this idea in view. The numbers of sixes compared

with the number of fours, the popularity of right and left drive, the number of cars equipped with wire wheels and worm drive, the numerical importance of electric and air starters, and the different body types and their seating capacity are listed in order, from left to right and enable one to get a general idea of the characteristics of the various models.

A study of the tables reveals many interesting facts and gives

Car Name	Name of Maker	Address	No. Chassis Models	Six-Cylinder	Four-Cylinder	Right Drive	Left Drive	Worm Drive	Wire Wheels	Electric Crankers	Air Crankers	Body Types & Seating Cap.						
												Roadsters, 2&3	Touring				Coupes	Large Incl. Cars
													4	5	6	7		
Abbott-Detroit	Abbott Motor Co.	Detroit, Mich.	3	1	2	2	1			3		3	1	1		2	1	2
Allen	Allen Motor Car Co.	Fostoria, Ohio	1		1		1			1		1		1				
American	American Motors Co.	Indianapolis, Ind.	2	2		2				2		4		3	1		2	
Ames	Ames Motor Car Co.	Owensboro, Ky.	1		1		1			1		1		1				
Apperson	Apperson Bros. Automobile Co.	Kokomo, Ind.	6	4	2		6			6		3		4			1	1
Arbenz	Arbenz Car Co.	Chillicothe, Ohio	1		1		1			1		1		1				
Auburn	Auburn Automobile Co.	Auburn, Ind.	4	2	2	1	3			4		2		2	2		2	
Austin	Austin Automobile Co.	Grand Rapids, Mich.	2	1	1		2			1	1	2		2		2		2
Buick	Buick Motor Co.	Flint, Mich.	3	1	2		3			3		3		2		1	1	
Cadillac	Cadillac Motor Car Co.	Detroit, Mich.	1		1	1				1		1	1	1	1	1	1	2
Cameron	Cameron Car Co.	West Haven, Mass.	1				1			1		1		1				
Cartercar	Cartercar Co.	Pontiac, Mich.	2		2	2				2		2		2			1	1
Case	J. I. Case T. M. Co.	Racine, Wis.	3		3	1	2			3		1		3		1		
Chadwick	Chadwick Engineering Works	Pottstown, Pa.	2	2		2				1		1		1	1	1	2	
Chalmers	Chalmers Motor Co.	Detroit, Mich.	1	1			1			1		1	1	1	1	1	1	
Chandler	Chandler Motor Co.	Cleveland, Ohio	1	1			1			1		1		1				1
Chevrolet	Chevrolet Motor Co.	Flint, Mich.	2		2		2					1		1				
Church	Church Motor Car Co.	Detroit, Mich.																
Coe	Coe-Mitchell Auto. Co.	Chicago, Ill.	1		1	1				1		1		1				
Colby	Standard Motor Co.	Minneapolis, Minn.	1	1	1	1				1		1		1		1	1	
Cole	Cole Motor Car Co.	Indianapolis, Ind.	2	1	1		2			2		2	1	1	1	1	2	1
Continental	Martindale & Millikan	Franklin, Ind.	2		2	1	1			1		1		2				
Corbitt	Corbitt Automobile Co.	Henderson, N. C.	1	1	1	1				1		1	1	1	1	1		
Correja	Van Dewater & Co.	Elizabeth, N. J.	1	1			1			1		1		1	1			1
Crane	Crane Motor Car Co.	Bayonne, N. J.	1	1			1			1		1		1				
Crow-Elkhart	Crow Motor Co.	Elkhart, Ind.	3	1	2	3				2		3	2	3	2			
Crown	Crown Motor Car Co.	Louisville, Ky.																
Croxton	Croxton Motor Car Co.	Washington, Pa.	1		1		1					1		1				
Cunningham	James Cunningham, Son & Co.	Rochester, N. Y.	1		1		1			1		1		1		1		3
Davis	George W. Davis Carriage Co.	Richmond, Ind.	3	2	1	1	2			3		1		3	1			
Day	Day Automobile Co.	Detroit, Mich.	1		1	1						1		1				
DeSoto	DeSoto Motor Car Co.	Auburn, Ind.	1	1		1						1		1				
Detroit	Briggs-Detroit Co.	Detroit, Mich.	1				1					3		2				
Dispatch	Dispatch Motor Car Co.	Minneapolis, Minn.	1		1	1						1		1	1	1	1	
Dorris	Dorris Motor Car Co.	St. Louis, Mo.	1		1		1			1		1		1	1	1	1	
Duryea	Duryea Motor Co.	Saginaw, Mich.	1		1							1		1				
Empire	Empire Automobile Co.	Indianapolis, Ind.	1		1	1						1		1				
Enger	Enger Motor Car Co.	Cincinnati, Ohio	1		1	1				1		1		1				
Fal	F. A. L. Motor Co.	Chicago, Ill.	2		2	2					1	2	1	1				
Fiat	Fiat Co.	Poughkeepsie, N. Y.	3	1	2	3						5		3		3		9
Firestone-Columbus	Columbus Buggy Co.	Columbus, Ohio	4	1	3		4			4		2		3			1	1
Flyer	Flyer Motor Car Co.	Detroit, Mich.	1		1		1			1		1		1				
Ford	Ford Motor Co.	Detroit, Mich.	1		1		1					1		1				1
Franklin	H. H. Franklin Mfg. Co.	Syracuse, N. Y.	1	1			1			1		1		1			1	3
Gleason	Bauer Machine Works Co.	Kansas City, Mo.	1			1						2		1				
Glide	Bartholomew Co.	Peoria, Ill.	1		1		1			1		1		1				
Grant	Grant Motor Car Co.	Detroit, Mich.	1		1		1					1		1				
Great Eagle	United States Carriage Co.	Columbus, Ohio	1		1		1			1						1		2
Great Southern	Great Southern Automobile Co.	Birmingham, Ala.	1		1	1										1		
Great Western	Great Western Auto Co.	Peru, Ind.	1		1	1				1		1	1	1				
Havers	Havers Motor Car Co.	Port Huron, Mich.	2	2		2				2		1		1				
Haynes	Haynes Automobile Co.	Kokomo, Ind.	3	2	1		3			3		2	2	2	1	1	2	1
Henderson	Henderson Motor Car Co.	Indianapolis, Ind.	2	1	1		2			2		2		3				
Herreshoff	Herreshoff Motor Co.	Detroit, Mich.	2	1	1		2			2		3	1	2	1	1	1	
Holly	Holly Motor Co.	Mt. Holly, N. J.	1	1			1			1		1		1	1	1		
Howard	Central Car Co.	Connersville, Ind.	1	1			1			1		1		1				
Hudson	Hudson Motor Car Co.	Detroit, Mich.	2	2			2			2		1		1	1	1	1	1
Hupmobile	Hupp Motor Car Co.	Detroit, Mich.	2		2	2						1		1	1		1	
Illinois	Overholt Co.	Galesburg, Ill.	1		1	1					1			1				
Imperial	Imperial Automobile Co.	Jackson, Mich.	4	2	2	3	1			4		2	2		3			
Inter-State	Inter-State Automobile Co.	Muncie, Ind.	1	1			1			1				1				
Jackson	Jackson Automobile Co.	Jackson, Mich.	3	1	2	3				3		1		3				
Jeffery	Thos. B. Jeffery Co.	Kenosha, Wis.	2	1	1		2			2		2		2	1		1	4
Keeton	Keeton Motor Car Co.	Detroit, Mich.	1	1			1			1		2		1		1	1	1
King	King Motor Car Co.	Detroit, Mich.	1		1		1			1		1		1				
Kissel	Kissel Motor Car Co.	Hartford, Wis.	3	2	1		3			3		3		3		1	1	2
Klinekar	Kline Motor Car Corp.	Richmond, Va.	4	2	2	1	3			4		2	3	2	1	1	3	
Knox	Knox Automobile Co.	Springfield, Mass.	4	2	2	3	2			4		4	3	2	3	2		6
Krit	Krit Motor Car Co.	Detroit, Mich.	1		1		1					1		1				
Lambert	Buckeye Manufacturing Co.	Anderson, Ind.	2		2	1	1			2		2		1	1			
Lenox	Lenox Motor Car Co.	Boxton, Mass.	2	1	1					2		2		2	1	1		

\*2 Cylinder



# Giving Principal Specification Details

at a glance the trend of American automobile design for 1914. The well-known tendency toward concentration on a single model is shown by the fact that sixty-eight concerns make one type only, thirty-six produce two, twenty-two offer three styles of chassis and only one company lists as many as six.

Worm drive, so popular in England, is seen on just one car. Six-cylinder motors are fitted to 45 per cent of the machines

and left drive is now on 156 cars or roughly on 65 per cent. The popularity of the self-starter is indicated by the fact that all but thirty-three models have cranking equipment. Electric starters are greatly in the lead being fitted to 209 machines as against eight pneumatic equipped cars. Only ten models are fitted with the wire wheel as standard. Two-cylinder motors are on two cars only.

Car Name	Name of Maker	Address	No. Chassis Models	Six-Cylinder	Four-Cylinder	Right Drive	Left Drive	Worm Drive	Wire Wheels	Electric Crankers	Air Crankers	Body Types & Seating Cap.					
												Roadsters, 2&3	Touring				Large Incl. Cars
													4	5	6	7	
Lewis	L. P. C. Motor Co.	Racine, Wis.	1	1						1							
Locomobile	Locomobile Co. of America	Bridgeport, Conn.	3	3		2				3		2	3	3	1	2	1
Lozier	Lozier Motor Co.	Detroit, Mich.	2	1	1					2		2		2	1	1	2
Luverne	Luverne Automobile Co.	Luverne, Minn.	1	1			1				1						
Lyons-Knight	Lyons-Atlas Co.	Indianapolis, Ind.	2	1	1		2		2	2				2		2	4
Marathon	Marathon Motor Works	Nashville, Tenn.	3		3	3				2		3	2	3			
Marion	Marion Motor Car Co.	Indianapolis, Ind.	2	1	1		2			2		3		2			2
Marmon	Nordyke & Marmon Co.	Indianapolis, Ind.	3	2	1		3			3		4	3	3		2	6
Mason	Mason Motor Co.	Waterloo, Ia.															
Maxwell	Maxwell Motor Co.	Detroit, Mich.	3	1	2	1	3			3				2		1	
McFarlan	McFarlan Motor Car Co.	Connersville, Ind.	1	1			1				1	1	1	1	1	1	1
McIntyre	W. W. McIntyre Co.	Auburn, Ind.															
Mercer	Mercer Automobile Co.	Trenton, N. J.	3		3	3				2		2		2			
Metropol	Metropol Motor Corp.	New York	1		1	1						1	1				
Meteor	Meteor Motor Car Co.	Shelbyville, Ind.	3	1	2	3				3				3			
Metz	Metz Co.	Waltham, Mass.	1		1		1					1					
Mitchell-Lewis	Mitchell-Lewis Motor Co.	Racine, Wis.	3	2	1		3			3		2	2	2		1	
Moline-Knight	Moline Automobile Co.	E. Moline, Ill.	1		1		1			1				1		1	
Monarch	Monarch Motor Car Co.	Detroit, Mich.	1		1	1				1				1			
Mondex-Magic	Aristos Co.	New York	2	2			2		2	2			1		2		2
Moon	Moon Motor Car Co.	St. Louis, Mo.	2	1	1		2			2		2	2	2	1		2
Morse	Easton Machine Co.	S. Easton, Mass.	1		1	1				1		1	1	1		1	
Moyer	H. A. Moyer	Syracuse, N. Y.	2	1	1	2				2		1		1		1	
Multiplex	Multiplex Mfg. Co.	Berwick, Pa.															
National	National Motor Vehicle Co.	Indianapolis, Ind.	2	1	1		2			2		2	2	2		1	1
Norwalk	Norwalk Motor Car Co.	Martinsburg, W. Va.	2	2			2			2		2	2		2		2
Oakland	Oakland Motor Car Co.	Pontiac, Mich.	2	1	1		2			2		1		1			1
Ohio	Crescent Motor Co.	Cincinnati, Ohio	2	1	1	1	1			2		2		2			
Oldsmobile	Olds Motor Works	Lansing, Mich.	1	1						1		1		1		1	1
Overland	Willys-Overland Co.	Toledo, Ohio	1		1	1				1		1		1			1
Packard	Packard Motor Car Co.	Detroit, Mich.	2	2			2			2		4	3	3	3	4	37
Paige-Detroit	Paige-Detroit Motor Car Co.	Detroit, Mich.	2	2	2	1	1			1		1		2		1	1
Palmer-Singer	Palmer & Singer Mfg. Co.	New York	2	2		1	1			2		2					
Partin-Palmer	Partin Manufacturing Co.	Chicago													1		
Paterson	W. A. Paterson Co.	Flint, Mich.	1		1		1			1				1			
Pathfinder	Motor Car Mfg. Co.	Indianapolis, Ind.	2	1	1	1	1			2		1		1	1	1	
Peerless	Peerless Motor Car Co.	Cleveland, Ohio	3	3	3	3	3			3		1	1	1	2	2	9
Pierce-Arrow	Pierce Arrow Motor Car Co.	Buffalo, N. Y.	3	3	3	3	3			3		3	3	3	3	6	16
Pilot	Pilot Motor Car Co.	Richmond, Ind.	2	1	1	2	2			2		2	2	2	2	2	
Pope-Hartford	Pope Mfg. Co.	Hartford, Conn.	1														
Pratt	Elkhart Car & Harness Mfg. Co.	Elkhart, Ind.	1		1					1		1	1	1		1	
Premier	Premier Motor Mfg. Co.	Indianapolis, Ind.	2	2			2			2		2		2		1	
Pullman	Pullman Motor Car Co.	York, Pa.	4	2	2	1	4		1	4			1	1		2	
Rayfield	Rayfield Motor Car Co.	Chrisman, Ill.	1	1		1				1		1	1	1	1		1
Read	Read Motor Car Co.	Detroit, Mich.	1		1		1						1		1		
Regal	Regal Motor Car Co.	Detroit, Mich.	2		2		2			2		1		2			1
Reo	Reo Motor Car Co.	Lansing, Mich.	1		1		1			1		1		1			
Republic	Republic Motor Car Co.	Hamilton, Ohio	1	1			1			1		1		1		1	
Richmond	Wayne Works	Richmond, Ind.	3	1	2	3				3				3			
Saxon	Saxon Motor Co.	Detroit, Mich.	1		1		1		1			1					
Selden	Selden Motor Vehicle Co.	Rochester, N. Y.	1		1	1				1		1		1			
S. G. V.	S. G. V. Co.	Reading, Pa.	1		1		1			1		1	1	1			3
S. & M.	S. & M. Motor Co.	Detroit, Mich.	1	1			1		1	1		1		1		2	
Simplex	Simplex Automobile Co.	New Brunswick, N. J.	3		3	3				3				2		2	4
Spoerer	Carl Spoerer's Co.	Baltimore, Md.	1		1	1				1		1		1		1	
Spaulding	Spaulding Mfg. Co.	Grinnell, Iowa	1		1		1			1				1			
Speedwell	Speedwell Motor Car Co.	Dayton, Ohio	1	1			1			1			1	1		1	
Staver	Staver Carriage Co.	Chicago	2	1	1		2			2				1		1	
Stearns	F. B. Stearns Co.	Cleveland, Ohio	2	1	1		2			2		2	2	2	2	2	6
Stevens-Duryea	Stevens-Duryea Co.	Chicopee Falls, Mass.															
Studebaker	Studebaker Corp.	Detroit, Mich.	2	1	1		2			2				1		1	2
Stutz	Stutz Motor Car Co.	Indianapolis, Ind.	4	2	2	4				4		4			2		2
Touraine	Touraine Co.	Philadelphia, Pa.	1	1			1			1		1		1		1	
Traveler	Traveler Motor Car Co.	Detroit, Mich.															
Tribune	Tribune Motor Co.	Detroit, Mich.	1		1		1							1			
Vaughan	Vaughan Car Co.	Kingston, N. J.	1	1			1					1	2		2		
Vellie	Vellie Motor Vehicle Co.	Moline, Ill.	3	1	2		3			3		2	2	3			
Vulcan	Vulcan Mfg. Co.	Painsville, Ohio	1		1		1					1		1			
Wescott	Wescott Motor Car Co.	Richmond, Ind.															
White	White Co.	Cleveland, Ohio	3	1	2		3			3		3		3		2	3
Willys-Knight	Willys-Overland Co.	Toledo, Ohio	1		1		1	1	1	1		1		1		1	
Winton	Winton Motor Car Co.	Cleveland, Ohio	1	1			1			1		1	2	1	1	1	3
Zimmerman	Zimmerman Mfg. Co.	Auburn, Ind.	2		*1		1					1		1			

\*2 Cylinder

# Hartford Brings Out Electric Brake

**Designed to Operate Emergency Brakes on Either New or Old Cars—Installation Simply Calls for Removal of Levers and Brake Connections and Substitution of Electric Motor with Drum and Cable—Control on Steering Column**

**N**EW YORK CITY, Dec. 29—The electric brake for automobiles will be seen at the Palace Show next week. E. V. Hartford, of the Hartford Suspension Co., Jersey City, N. J., having perfected a brake of this type which is ready for the market. The Hartford electric brake is designed to operate the emergency brakes on any car, whether new or second-hand. It consists of a small electric motor coupled with a drum around which winds a cable, this cable being connected with a brake equalizer so that the regular emergency brakes on the car wheels are utilized, the installation of the electric brake simply calling for the removal of levers and brake connections and the substitution of the electric motor with its drum and cable in their places.

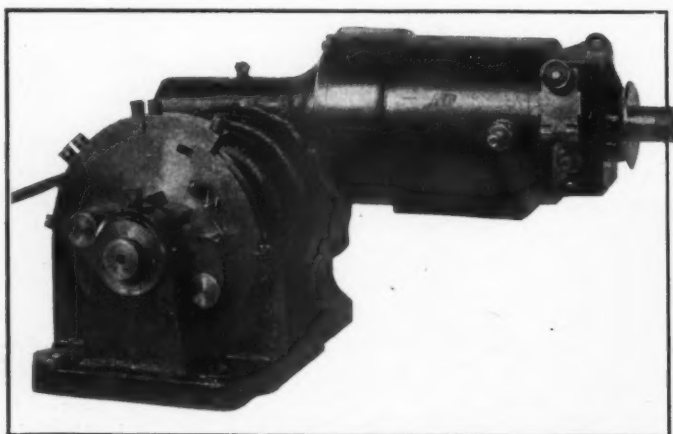
## Control Located on Steering Column

With this electric brake the control, consisting of a small lever with button, is located in the steering column beneath the wheel in a position where it can be operated without taking the hand from the steering wheel. The electric motor with its operating drum can be located any place on the car, namely, under front or rear seats, on the running board, or in any other convenient place, and as this unit is not more than 8 inches long, 6 inches wide, and about 4 inches high, the amount of space required for it is very small, and its weight is such that when the emergency brake lever with its connections is removed the weight taken off is practically the same as that added by the electric equipment.

The brake draws its electric current from the regular battery, which may be of 6, 12, or 24 volts, the small motor being wound for these voltages. The current consumed is very slight, not exceeding 4 or 5 amperes at 6 volts.

## Under Development for Three Years

This electric brake has been under development for 3 years and was originally brought out with the object of competing with the Westinghouse air brake for railroad service. Its chief



The new Hartford electric brake, consisting of a small, high-speed electric motor and a steel drum around which is wound a steel cable. The entire device forms a unit not more than 8 inches long, 6 inches wide and about 4 inches high

merit as applied to a motor car is its speed of operation in that it operates in a fifth of a second, as compared with 5 seconds for air-brake operations and various speeds for mechanical or lever applied brakes. Although a very small and compact unit, the electric motor exerts a pull of 1,000 pounds on the cable applying the brakes, a figure much in excess of that power that can be applied by hand operation.

## Elements of the System

The braking system is composed of a very small high-speed electric motor mounted on a suitable base; on one end of the armature shaft is a non-reversible worm which operates in turn on a spiral gear mounted on a shaft running on anti-friction bearings and carried transversely to the armature shaft, in the case. On one end of this transverse shaft is a steel drum 2 3/8 inches in diameter around which a steel cable is wound, one end of which is attached to the drum and the other to the brake lever or levers in the usual way; this cable taking the place of the rod which usually connects the emergency brake lever with the equalizer rod or brake rods under the car.

Between the drum and the worm gear drive inside the case which incloses the mechanism, is an adjustable friction clutch by means of which sufficient pressure is provided to transmit the maximum braking efficiency, but which, beyond that point, will slip. This eliminates any possible trouble with broken cables, pins or levers.

## Current Controller Is New Idea

The current controller is an entirely new development in electrical power controllers and is the device which made an efficient and practical electrical brake possible. By it, the electrical energy is so governed that the movement of the brake mechanism can be varied almost instantly, yet gradually, to any required degree or in an emergency can be applied in a fraction of a second.

On a motor car, the hand controller is mounted under the steering wheel with the lever so placed that it can be operated by the driver without removing his or her hand or hands from the wheel. A slight movement of the lever forward, to a certain point, where a click is heard, gives a certain positive movement to the electric motor, hence to the winding drum, by means of the length of contact permitted by the automatic controller; a repetition of the movement of the lever repeats the movement of the motor each time until the desired partial or complete braking movement is reached. If it is desired to apply the brakes quickly, to the limit of their capacity, it is only necessary to push the control lever forward as far as it will go. The effect is almost instantaneous.

## Flexibility of Control

Should it be desired to release the brakes, the control lever is moved in the direction opposite to that in which it was moved when applying pressure. The movement may be made only part way, to the first point of contact which will permit of the reversing of the electric motor, hence braking pressure, to be accomplished gradually, or by a full movement to the rear, the action will be as rapid in releasing as it was formerly in application.



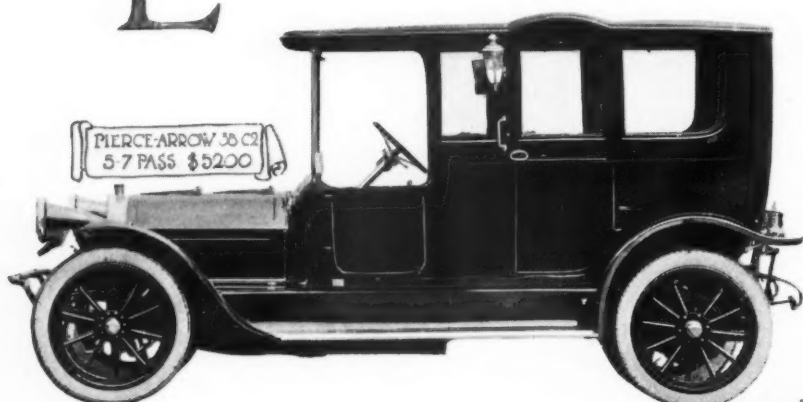


**F**OLLOWING its annual custom THE AUTOMOBILE gives in these pages an illustrated review of the cars of 1914. Here the body trends are illustrated and the leading specifications are printed. A study of the bodies for this year will show that the artistic development of the exterior has made immense strides in the past year. The streamline form that was just beginning to be talked about a year ago has now become common practice, not only in the higher-priced cars and limousines, but in the lower-priced cars and in the touring cars.

Electric lighting and starting has come to stay. Whereas less than 50 per cent. of the cars made last year were fitted with an electric current generator, 90 per cent. of the makers have fitted them for this year. These are not only in the medium and high-priced cars, but also in the lower-priced classes. Not only is the generator fitted, but an electric cranking motor and a high-capacity storage battery as well. With electric lighting, side lamps are disappearing and a smooth exterior cultivated.

Left drive and center control are other features which this year have come into general use. Many makers offer a choice of either and have on sale chassis which are alike in every particular except for this feature.

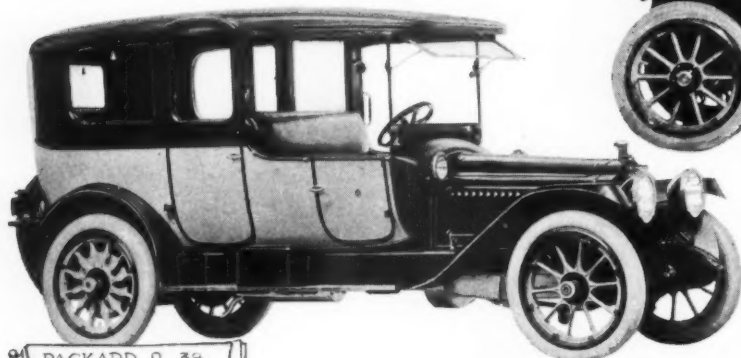
# Limousines and Landaulets Berlines and Sedans



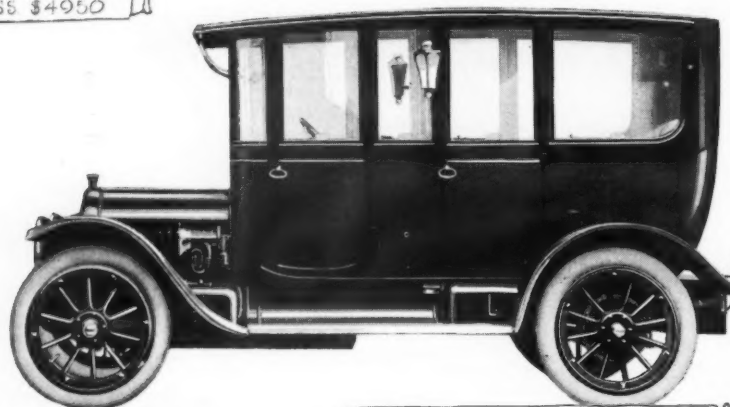
PIERCE-ARROW 38 C2  
5 7 PASS \$5200



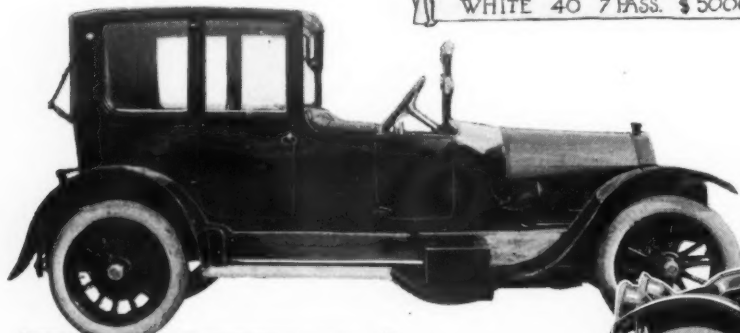
PEERLESS 60 6  
7 PASS. \$7000



PACKARD 2 38  
7 PASS \$4950



WHITE 40 7 PASS. \$5000



SIMPLEX 38 6 PASS \$6400



FRANKLIN 6 30  
5 PASS \$3400

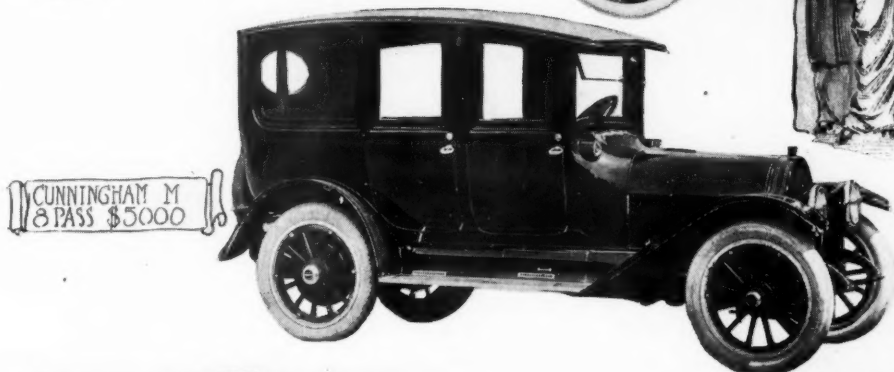
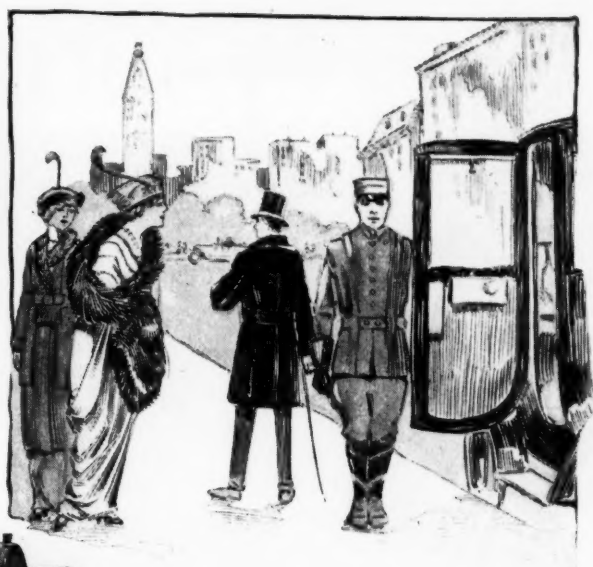
THERE are thirty-three manufacturers of limousine cars for 1914, these representing the majority of the high-price American builders.

Pierce-Arrow 38-C2, five or seven-passenger brougham, \$5,200. 38.40 H.P., optional W.B., 34 x 4 1/2-inch tires.  
Peerless 60-6, seven-passenger limousine, \$7,000. 60.00 H.P., 140-inch W.B., 38 x 5 1/2-inch tires.  
Packard 2-38, seven-passenger limousine, \$4,950. 38.40 H.P., 140-inch W.B., 37 x 5-inch tires.  
White 40 G.E.B., seven-passenger limousine, \$5,000. 28.90 H.P., 120-inch W.B., 36 x 4 1/2-inch tires.  
Simplex 38, six-passenger landaulet, \$6,400. 38.00 H.P., 137-inch W.B., 35 x 5-inch tires.  
Franklin 6-30, five-passenger berline, \$3,400. 31.60 H.P., 120-inch W.B., 34 x 4 1/2-inch tires.  
Chalmers Six 24, seven-passenger limousine, \$3,600. 38.40 H.P., 132-inch W.B., 36 x 4 1/2-inch tires.  
Cunningham M, eight-passenger berline, \$5,000. 36.10 H.P., 124-inch W.B., 36 x 4 1/2-inch tires.  
Knox 45, seven-passenger limousine, \$4,700. 40.00 H.P., 126-inch W.B., 37 x 5-inch tires.  
Winton 20, fore-door, seven-passenger limousine, \$4,600. 48.60 H.P., 130-inch W.B., 36 x 4 1/2-inch tires.  
Fiat 56, seven-passenger, \$6,000. 45.00 H.P., 135-inch W.B., 37 x 5-inch tires.  
Locomobile, Little Six, seven-passenger limousine, \$5,400. 43.80 H.P., 132-inch W.B., 36 x 5-inch tires.  
Lyons-Knight K-4, five-passenger sedan, \$3,900. 32.40 H.P., 130-inch W.B., 36 x 5-inch tires.

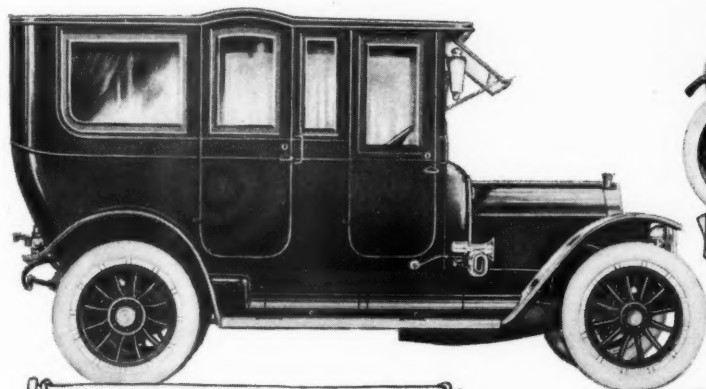




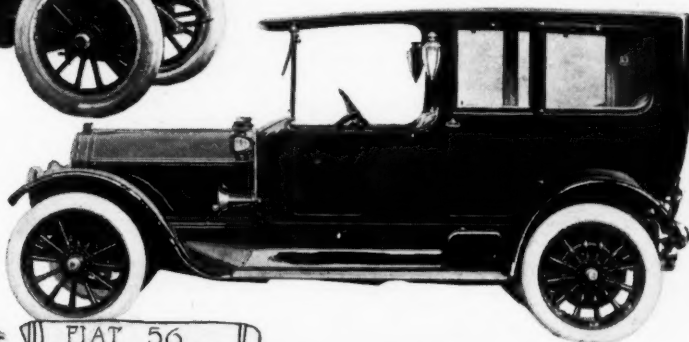
CHALMERS 24  
7 PASS \$3600



CUNNINGHAM M  
8 PASS \$5000



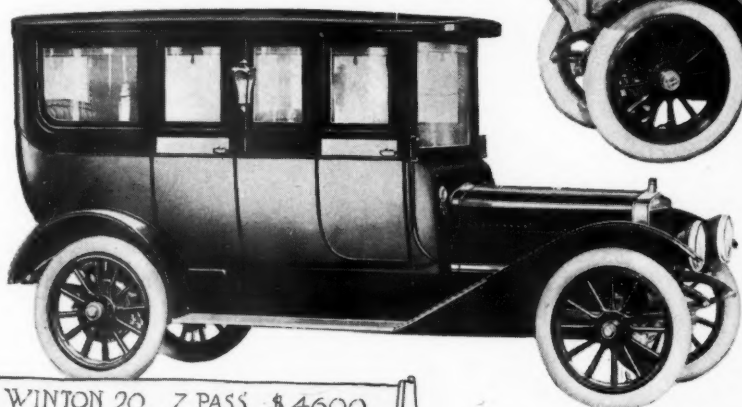
KNOX 4 45 7 PASS \$4700



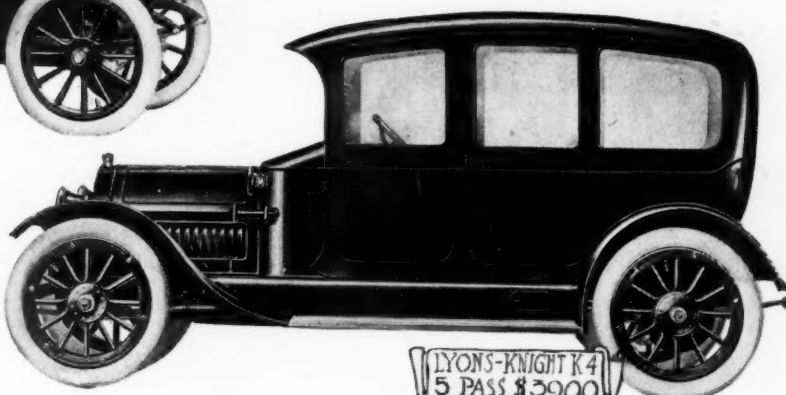
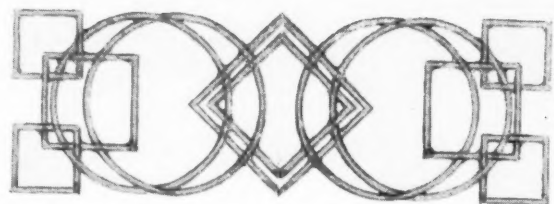
FIAT 56  
7 PASS \$6000



LOCOMOBILE 6 7 PASS \$5400



WINTON 20 7 PASS \$4600



LYONS-KNIGHT K4  
5 PASS \$3900

KEETON  
7 PASS. \$3975

HAYNES 27  
7 PASS. \$3850

HUDSON 6-54  
5 PASS. \$3100

McFARLAN 69T  
7 PASS. \$4000

FORD  
6 PASS. \$750

### Limousines

OF the thirty-three makers of American limousines nearly all have altered the style of body. The pronounced roof curve of a year ago is disappearing in favor of the softly-rounded style. There are more examples of doors arched into the roof than a year ago. Window spaces are generally larger, and the sashless type is gaining in popularity. Berline and sedan types are in greater numbers than heretofore. The sedan is generally a single-compartment vehicle which is ideally suited for home use where the owner drives. Interior limousine fixings are more luxurious than last year. American limousines do not show the versatility of design that was seen in the foreign ones at Olympia and Paris. Wire wheels are coming into use on the American town car, and as soon as the manufacturer can secure them in quantity many more will be seen with them.

Keeton, seven-passenger, \$3,975. 33.75 H.P., 136-inch W.B., 34 x 4½-inch tires.

Haynes 27, seven-passenger limousine, \$3,850. 43.80 H.P., 136-inch W.B., 36 x 4½-inch tires.

Hudson 6-54, five-passenger sedan, \$3,100. 40.90 H.P., 135-inch W.B., 36 x 4½-inch tires.

McFarlan 69 T, seven-passenger limousine, \$4,000. 38.40 H.P., 128-inch W.B., 36 x 4½-inch tires.

Ford, six-passenger town car, \$750. 22.50 H.P., 100-inch W.B., 30 x 3½-inch tires.

Cadillac, inside-drive, five-passenger limousine, \$2,800. 32.60 H.P., 120-inch W.B., 36 x 4½-inch tires.

Apperson 4-45, five-passenger sedan, \$2,500. 32.40 H.P., 120-inch W.B., 36 x 4-inch tires.

Stevens-Duryea C 6, five-passenger, demi-berline, \$5,550.

Studebaker Six, five-passenger sedan, \$2,250. 20.40 H.P., 121-inch W.B., 34 x 4-inch tires.

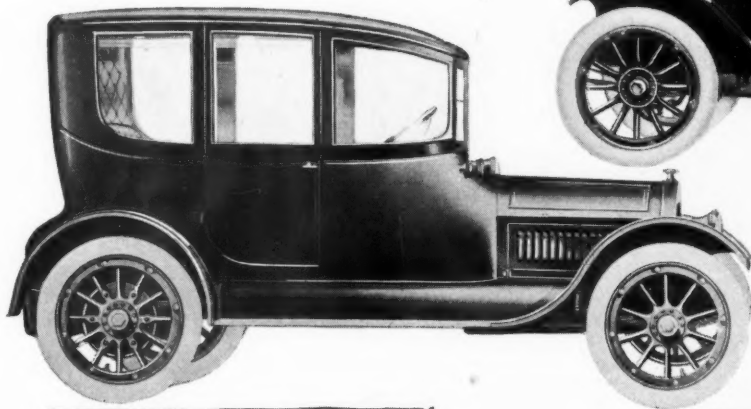
Paige 36, five-passenger sedan, \$1,950. 25.60 H.P., 116-inch W.B., 34 x 4-inch tires.

Kisselkar 40-4, five-passenger coupé, \$2,500-\$2,800. 32.40 H.P., 121-inch W.B., 34 x 4-inch tires.

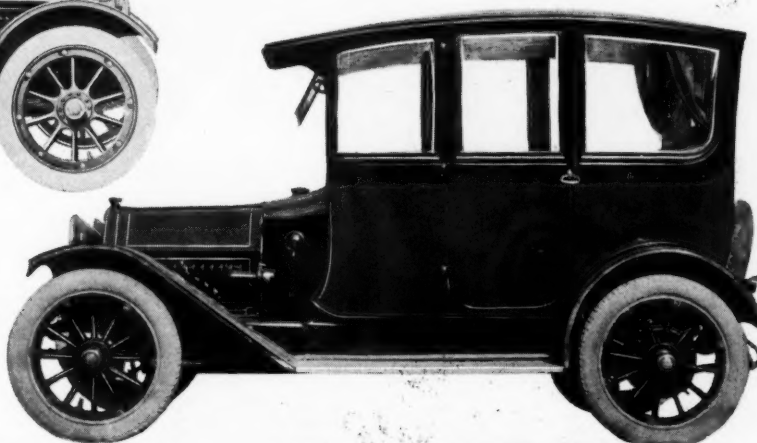




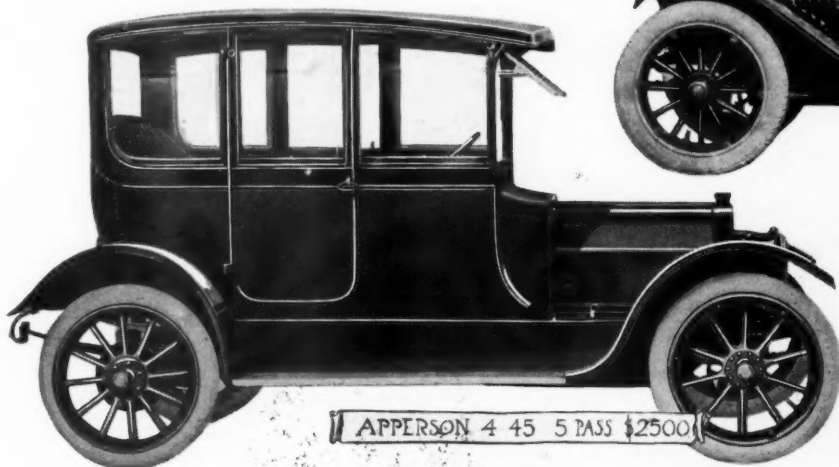
STUDEBAKER 6 5 PASS. \$2250



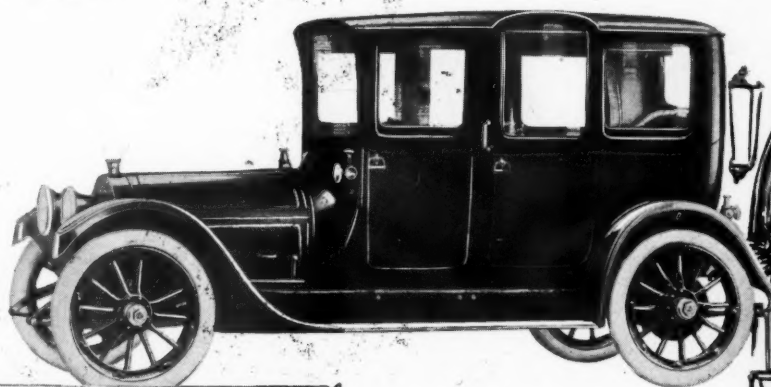
CADILLAC 5 PASS. \$2800



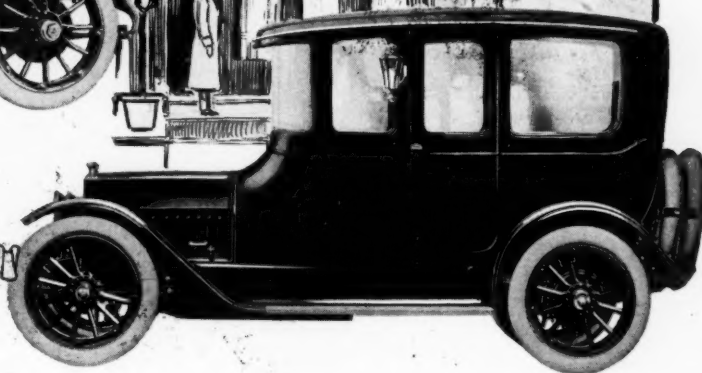
PAIGE 36 5 PASS. \$1950



APPERSON 4 45 5 PASS. \$2500



STEVENS-DURYEA C 6 5 PASS. \$3550



KISSELKAR 40 4 5 PASS. \$2800



# Coupés and Landau Roadsters

The coupé is quickly gaining ground as an all-year car. Here is shown the National 40, 3 pass., \$3,500.

FRANKLIN 630 3PASS \$2950

STUDEBAKER 6 2PASS \$1950

WHITE 40GE 3PASS \$4100

HUDSON 6 40 2PASS \$1950

HAYNES 6 26 4PASS \$3200

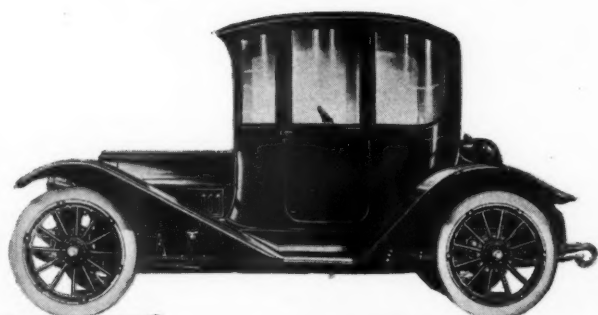
OVERLAND 79 4PASS \$1550

CADILLAC 3PASS \$2500

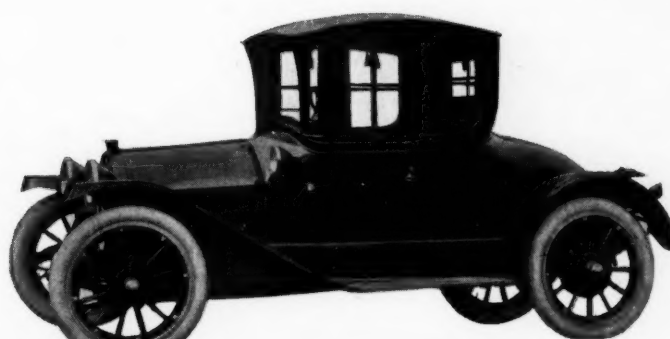
M'FARLAN 67T 4PASS \$3500

MARION 6 G 4PASS \$2650

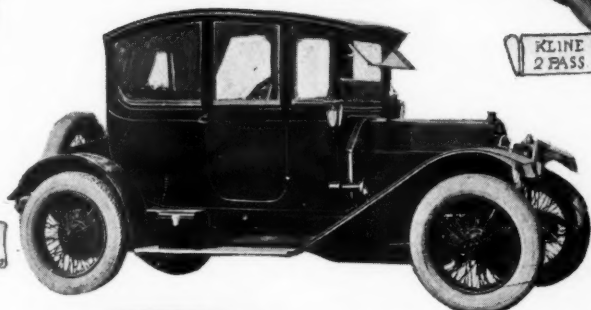




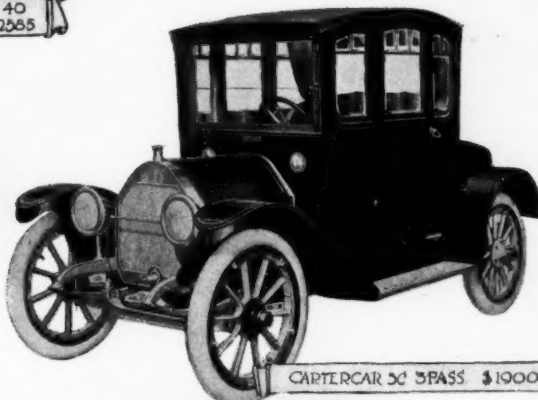
REGAL NC  
5 PASS \$1600



KLINE 4-40  
2 PASS \$2585



STUTZ E  
5 PASS \$2600



CARTERCAR 5C 5 PASS \$1000



MOON 42 4 PASS \$2550

CHALMERS 6-24  
5-4 PASS \$2880



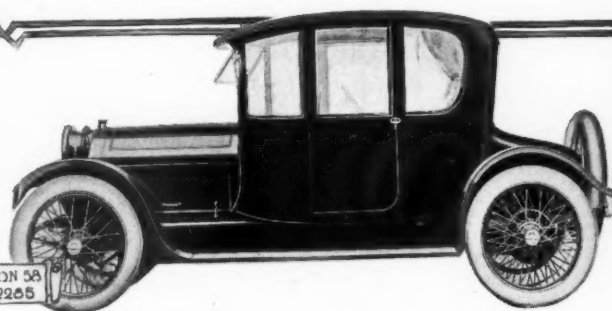
### Coupés and Landau Types

National, \$3,500. 57 H.P., 120 or 128-inch W.B., 36 x 4½-inch tires.  
Studebaker Six, two-passenger, landaulet roadster, \$1,950. 29.40 H.P., 121-inch W.B., 34 x 4-inch tires.  
Hudson 6-40, two-passenger cabriolet, \$1,950. 29.40 H.P., 123-inch W.B., 34 x 4-inch tires.  
McFarlan 67 T, four-passenger, \$3,300. 38.40 H.P., 128-inch W.B., 36 x 4½-inch tires.  
Marion Six, four-passenger, \$2,650. 33.75 H.P., 124-inch W.B., 35 x 4½-inch tires.  
Franklin 6-30, three-passenger, \$2,950. 31.60 H.P., 120-inch W.B., 34 x 4½-inch tires.  
White 40 G.E., three-passenger, \$4,100. 22.50 H.P., 110-inch W.B., 34 x 4-inch tires.  
Haynes Six 26, four-passenger, \$3,200. 43.80 H.P., 130-inch W.B., 36 x 4½-inch tires.  
Overland 79, four-passenger, \$1,550. 27.25 H.P., 114-inch W.B., 33 x 4-inch tires.  
Cadillac 1914, three-passenger, \$2,500. 32.60 H.P., 120-inch W.B., 36 x 4½-inch tires.  
Regal NC, three-passenger, \$1,600. 22.50 H.P., 108-inch W.B., 34 x 4-inch tires.

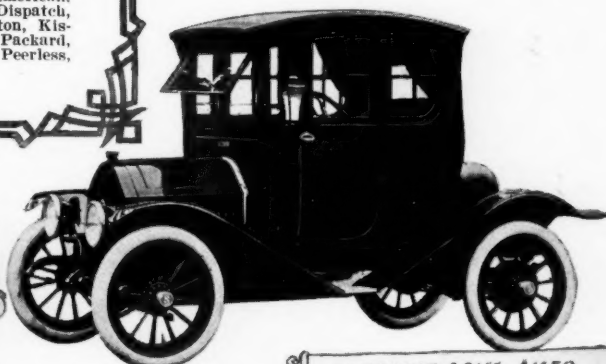
Stutz 4-E, three-passenger, \$2,600. 36.10 H.P., 120-inch W.B., 36 x 4½-inch tires.  
Moon 42, three-passenger, \$2,350. 32.40 H.P., 118-inch W.B., 34 x 4-inch tires.  
Henderson, De Luxe 58, three-passenger, \$2,285. 27.25 H.P., 116-inch W.B., 35 x 4½-inch tires.  
Kline 4-40, two-passenger, detachable-coupé roadster, \$2,585. 29.71 H.P., 120-inch W.B., 37 x 5-inch tires.  
Cartercar 5C, three-passenger, \$1,900. 27.25 H.P., 116-inch W.B., 36 x 4-inch tires.  
Chalmers Six 24, three and four-passenger, \$2,880. 38.40 H.P., 132-inch W.B., 36 x 4½-inch tires.  
Hupmobile H, three-passenger, \$1,350. 16.90 H.P., 106-inch W.B., 33 x 4-inch tires.  
Herreshoff 4-30, two-passenger, \$1,650. 18.25 H.P., 110-inch W.B., 32 x 3½-inch tires.  
In addition to these the following makes of coupés are not illustrated on these pages: Abbott-Detroit, American, Apperson, Arbenz, Buick, Cole, Dispatch, Firestone-Columbus, Jeffery, Keeton, Kisselkar, Locomobile, Lozier, Packard, Paige-Detroit, Pathfinder, Peerless, Stearns, Rayfield, Winton.



HUPMOBILE H  
3 PASS \$1350

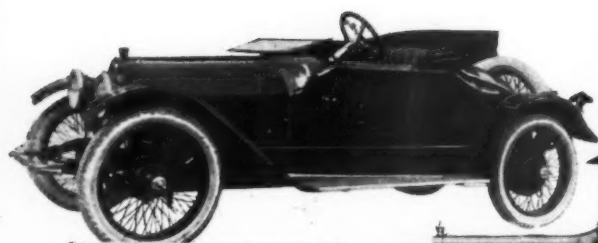


HENDERSON 58  
3 PASS \$2285



HERRESHOFF 2 PASS \$1650

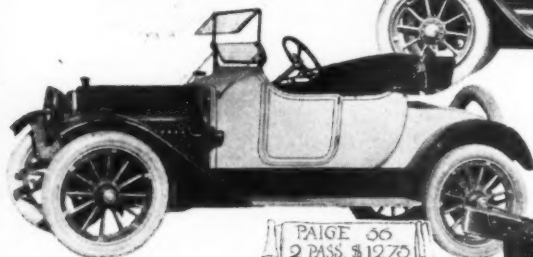
# Runabouts, Roadsters and Speedsters



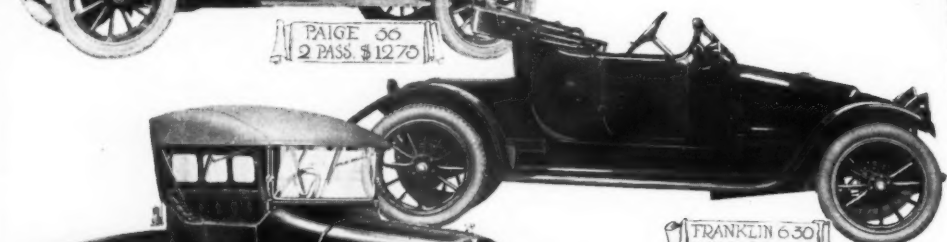
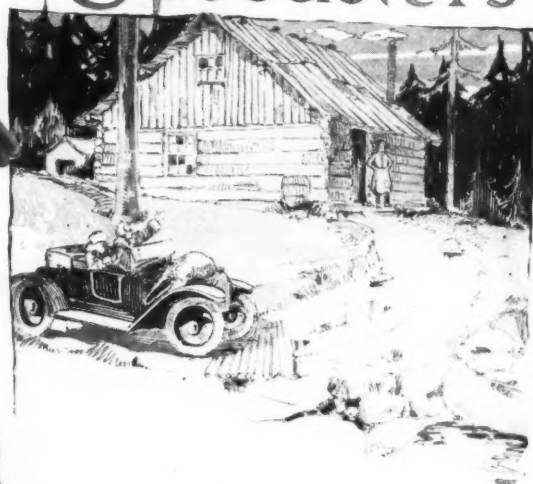
KLINE 6-60 2 PASS \$5500



STEARNS-KNIGHT 6 2 PASS \$4850



PAIGE 6-60 2 PASS \$1270

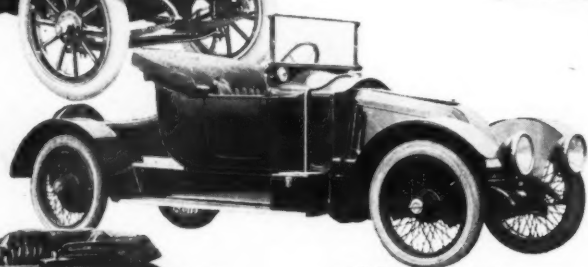
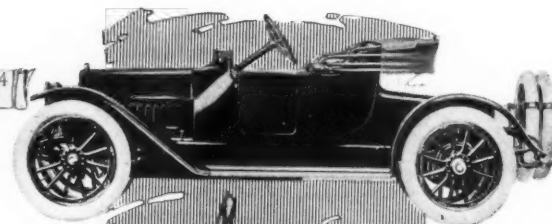


FRANKLIN 6-30 2 PASS \$2500

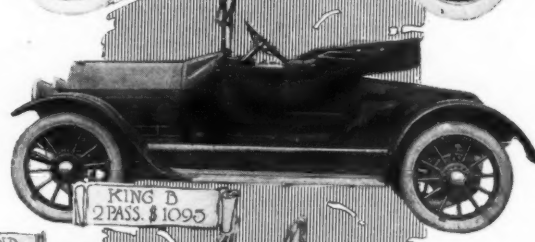


HUDSON 6-40 2 PASS \$1750

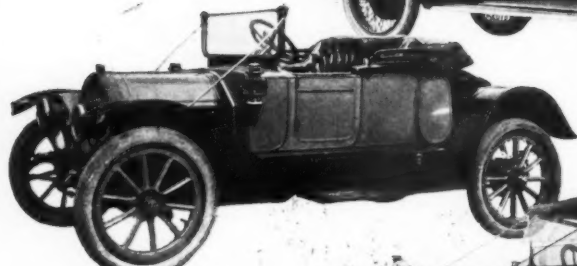
KISSEL CAR 4-4 2 PASS \$1850



KEETON 2 PASS \$3250

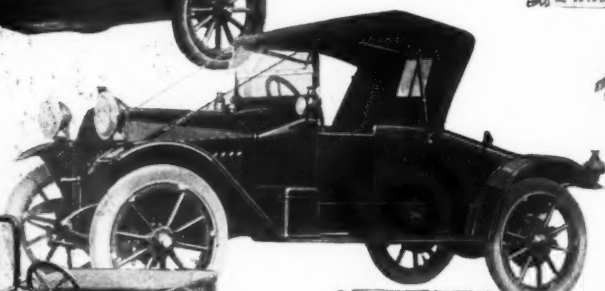
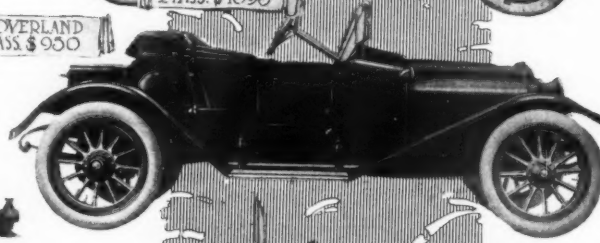


KING 8 2 PASS \$1095

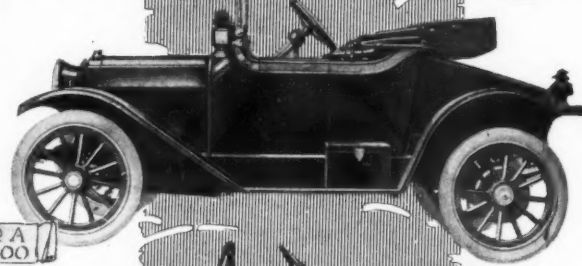


GT SOUTHERN 30 2 PASS \$1750

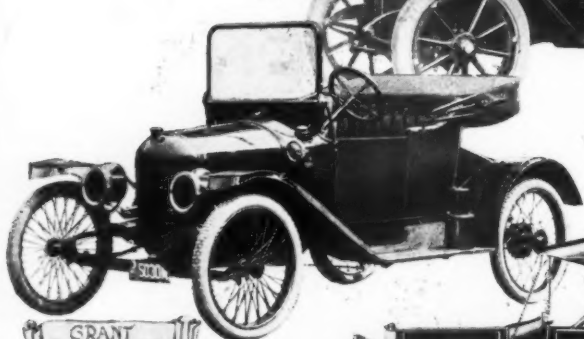
OVERLAND 2 PASS \$900



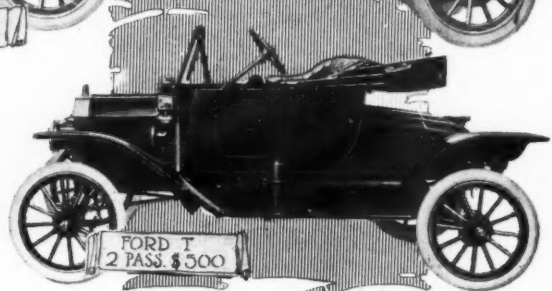
HUPMOBILE N R 2 PASS \$1050



DETROIT A 2 PASS \$900

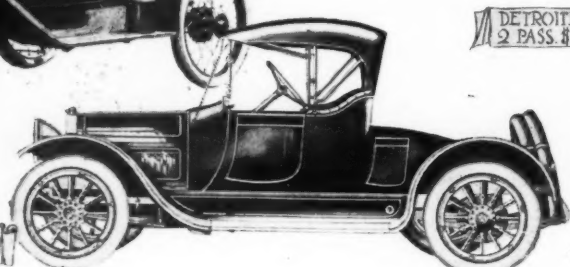


GRANT 2 PASS \$495



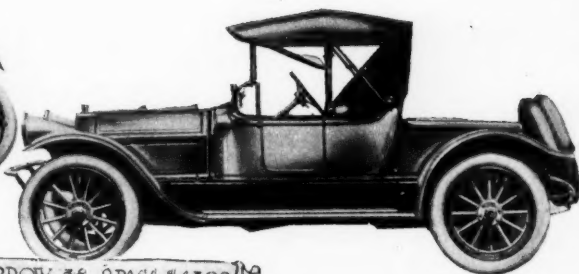
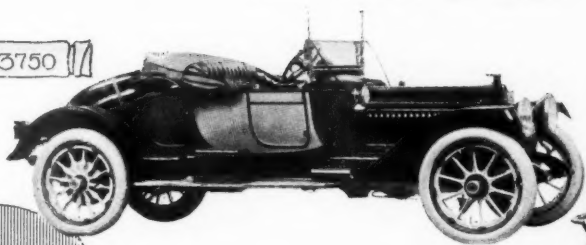
FORD T 2 PASS \$500

ALIEN 38 2 PASS \$1395

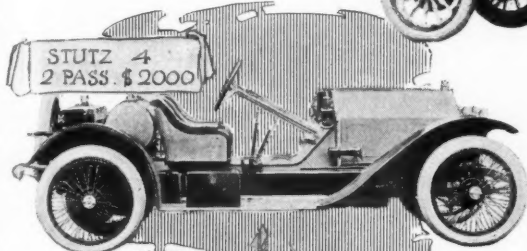
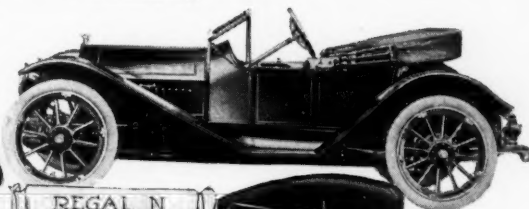
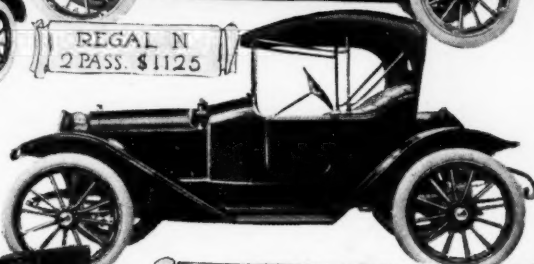




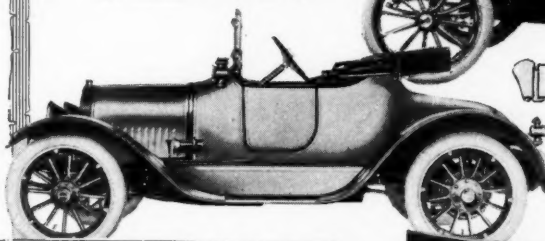
PACKARD 238 2 PASS. \$3750



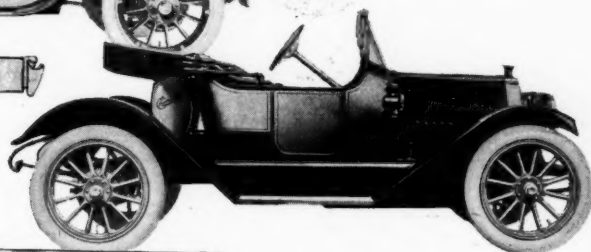
PIERCE-ARROW 36 2 PASS. \$4500

STUTZ 4  
2 PASS. \$2000MOON 42  
2 PASS. \$1750ENGER C  
2 PASS. \$1265REGAL N  
2 PASS. \$1125

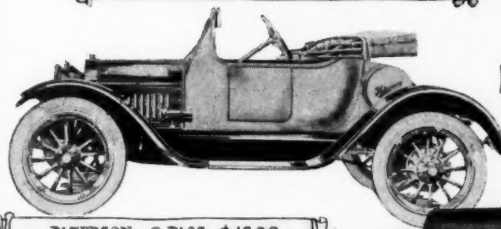
VULCAN 27 2 PASS. \$750



BUICK B 36 2 PASS. \$1235

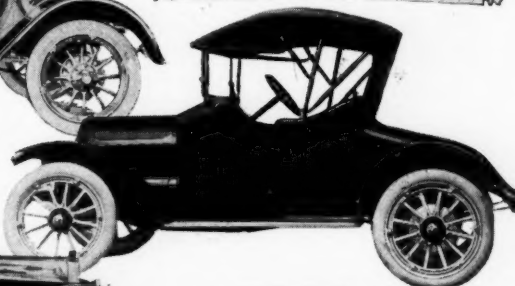


CHEVROLET H2 2 PASS. \$750

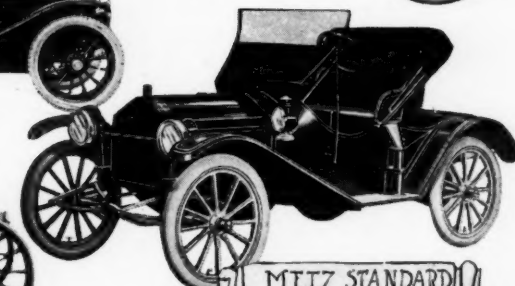
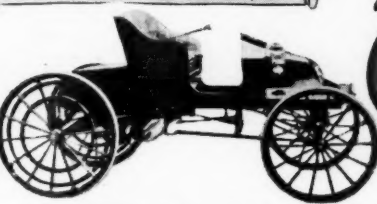


PATERSON 2 PASS. \$1200

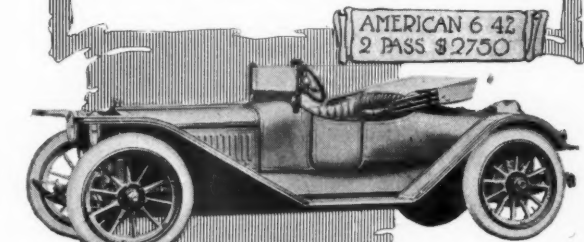
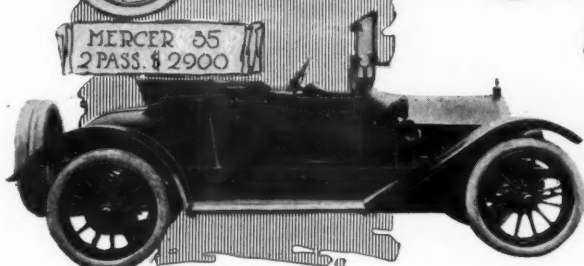
REO 2 PASS. \$1175



HERRISHOFF 6 2 PASS. \$1850

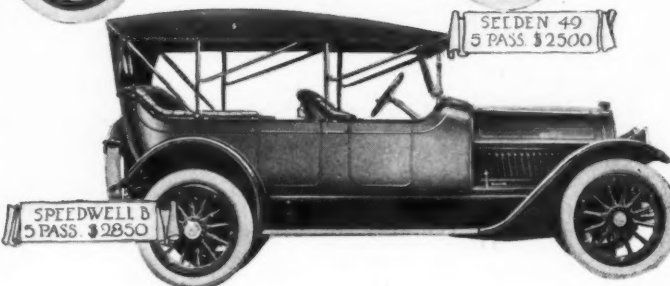
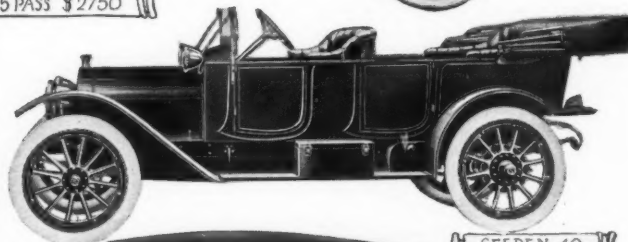
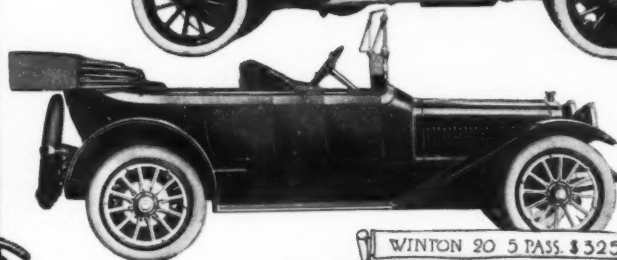
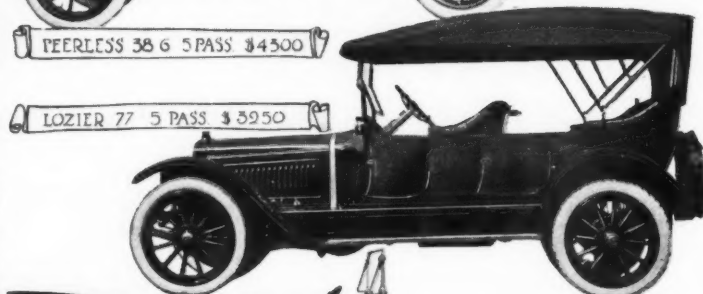
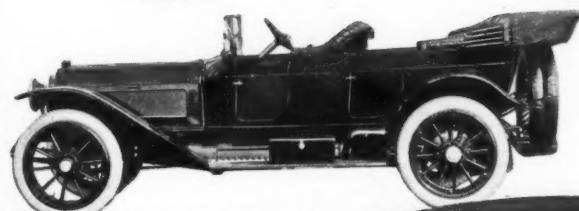
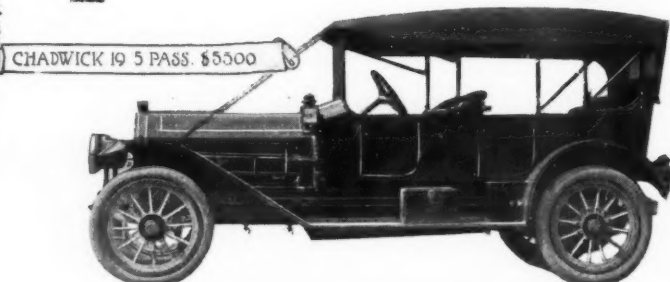
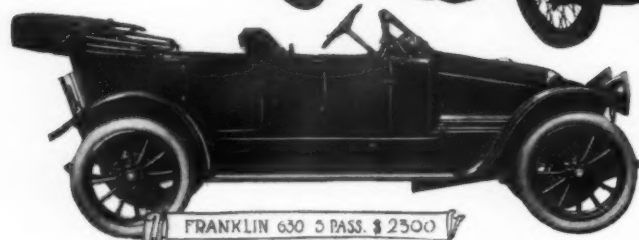
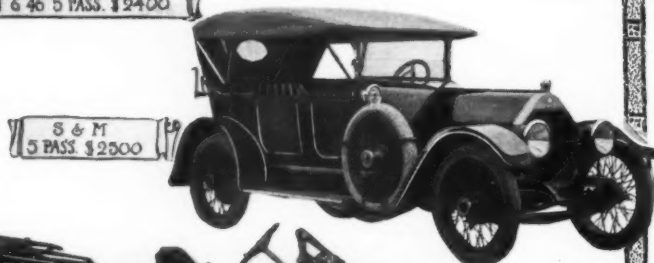
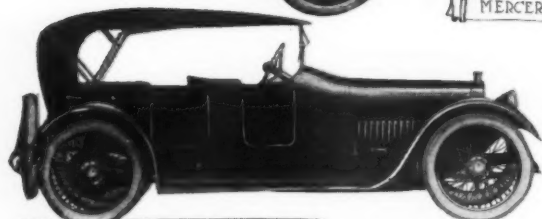
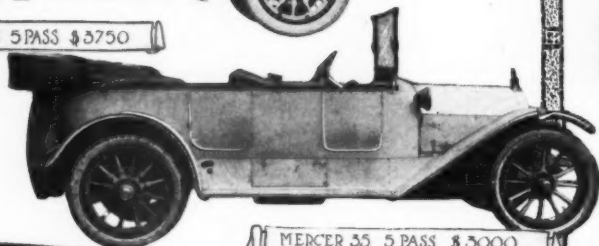
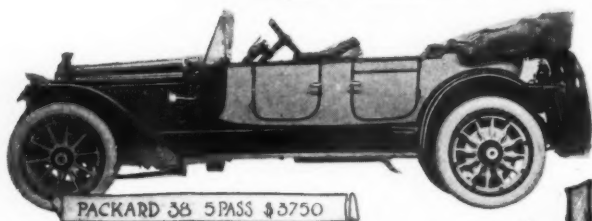
MITZ STANDARD  
2 PASS. \$475

DURYEA 2 PASS. \$450

AMERICAN 6 42  
2 PASS. \$2750MERCER 35  
2 PASS. \$2900

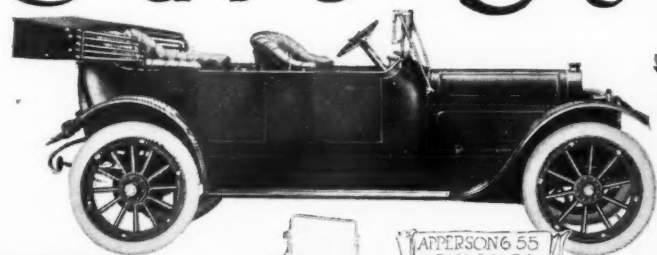
Klinekar 6-60, detachable-coupe roadster, \$3,500. 44.88 H.P., 133-inch W.B., 37 x 5 tires.  
 Stearns-Knight Six, \$4,850. 43.80 H.P., 134-inch W.B., 34 x 4-inch tires.  
 Paige, 36, \$1,275. 25.60 H.P., 116-inch W.B.  
 Franklin 6-30, \$2,300. 31.60 H.P., 120-inch W.B., 34 x 4 1/4-inch tires.  
 Hudson 6-40, \$1,750. 29.40 H.P., 123-inch W.B., 34 x 4-inch tires.  
 Keeton, \$3,250. 33.75 H.P., 136-inch W.B.  
 Great Southern 50, \$1,750. 43.03 H.P., 128-inch W.B., 36 x 4 1/4-inch tires.  
 Hupmobile H.R., \$1,050. 16.90 H.P., 106-inch W.B., 33 x 4-inch tires.  
 Grant, \$495. 12.10 H.P., 90-inch W.B.  
 Allen 38, \$1,395. 27.25 H.P., 118-inch W.B., 34 x 4-inch tires.  
 Kisselkar 40-4, \$1,850. 22.50 H.P., 121-inch W.B., 36 x 4-inch tires.  
 King B, \$1,095. 24.00 H.P., 112-inch W.B.  
 Overland, \$950. 27.25 H.P., 114-inch W.B.  
 Detroit A 3 & A 4, \$900. 19.60 H.P., 104-inch W.B., 32 x 3 1/4-inch tires.  
 Ford T, \$500. 22.50 H.P., 100-inch W.B.  
 Stutz Series E, Bearcat, four-cylinder \$2,000. 36.10 H.P., 120 W.B., 36 x 4 1/4-inch tires; six-cylinder \$2,250. 38.40 H.P., 120 W.B.  
 Moon 42, \$1,750. 32.40 H.P., 118 W.B.  
 Enger C, \$1,285. 32.40 H.P., 120 W.B.  
 Regal H, \$1,125. 22.50 H.P., 109 W.B.  
 Buick B 36, \$1,235. 22.50 H.P., 112 W.B.  
 Chevrolet Royal Mail H-2, \$750. 21.38 H.P., 104 W.B., 30 x 3 1/2 tires.  
 Paterson 35, \$1,200. 19.60 H.P., 112 W.B.  
 Reo the Fifth S T 5, \$1,175. 25.60 H.P., 112 W.B., 34 x 4 tires.  
 Herrishoff 6-40, \$1,850. 27.25 H.P., 124 W.B.  
 Metz, \$475. 22.50 H.P., 90 W.B., 30 x 3 tires.  
 Duryea Buggyaut, \$450. 86 W.B., 44 x 1 1/2 tires.  
 American 6-42, \$2,750. 43.80 H.P., 140 W.B.  
 Mercer Series O, Type 35, \$2,900. 32.40 H.P., 144 W.B., 37 x 5 tires.  
 Packard 238 Phaeton runabout, \$3,750.  
 Pierce-Arrow 36 C-2, \$4,300. 38.40 H.P., optional W.B., 36 x 4 1/4 tires.  
 Vulcan 27, \$750. 18.25 H.P., 105 W.B.

# Touring

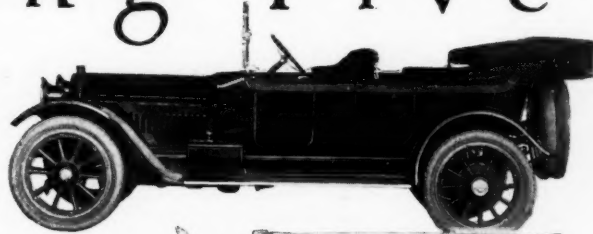




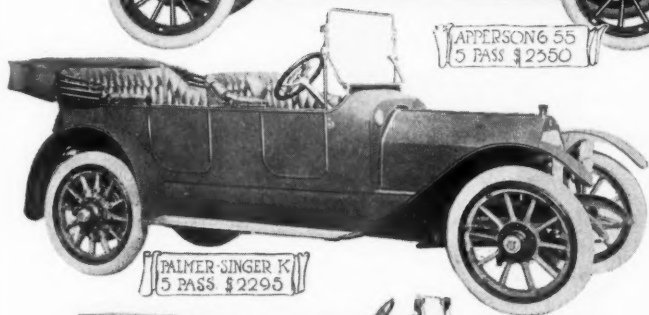
# Cars Seating Five



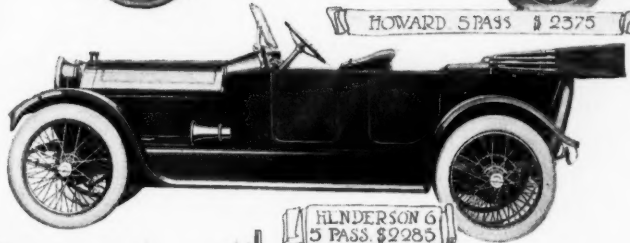
APPERSON 6-55  
5 PASS \$2550



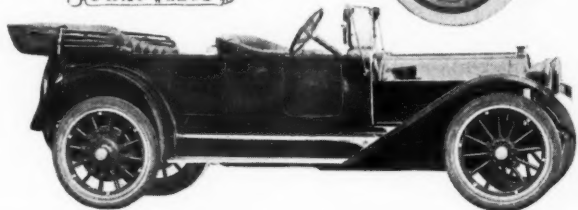
HOWARD 5-PASS \$2375



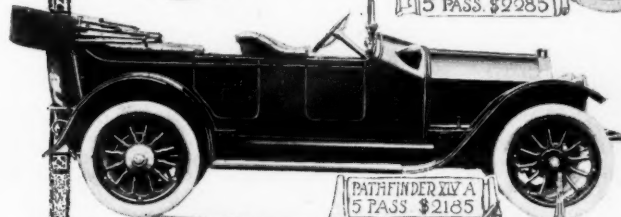
PALMER-SINGER K  
5 PASS \$2295



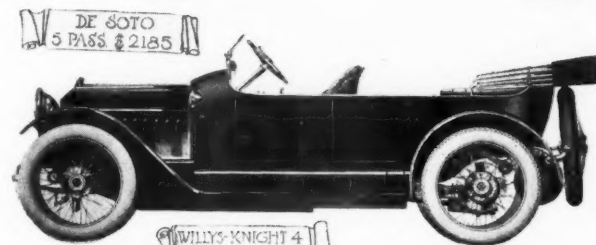
HENDERSON 6  
5 PASS \$2285



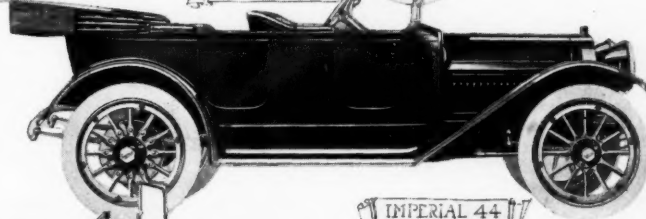
DE SOTO  
5 PASS \$2185



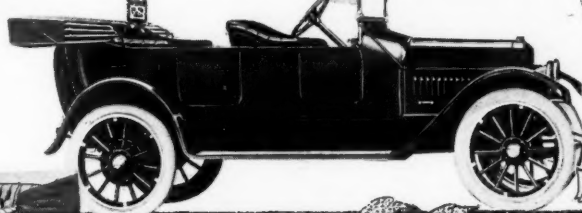
PATHFINDER 4-A  
5 PASS \$2185



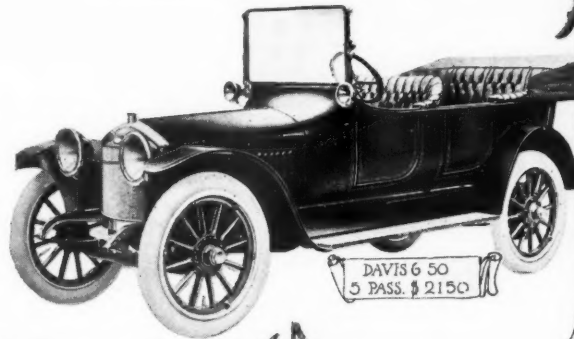
WILLYS-KNIGHT 4  
5 PASS



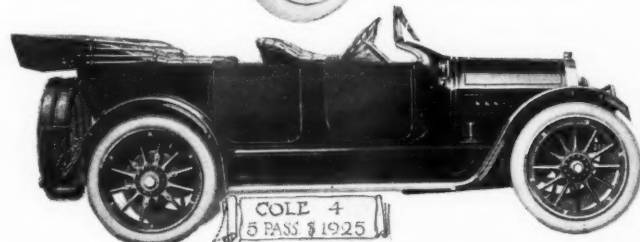
IMPERIAL 44  
5 PASS \$2000



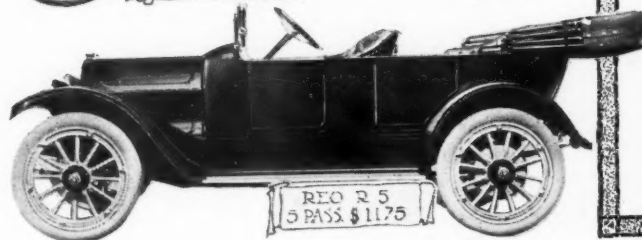
JACKSON MAJESTIC  
5 PASS \$1685



DAVIS 6-50  
5 PASS \$2150



COLE 4  
5 PASS \$1925



REO 2-5  
5 PASS \$1175

## Five-Passenger Cars

THE five-passenger car continues as popular as heretofore, and seems in more demand with the majority of buyers than the four-passenger types. Few of the five-passenger bodies are provided with additional tonneau seats, these being generally confined to six and seven-passenger styles. The lines of the five-passenger car rarely differ from those of the large models made by the same companies.

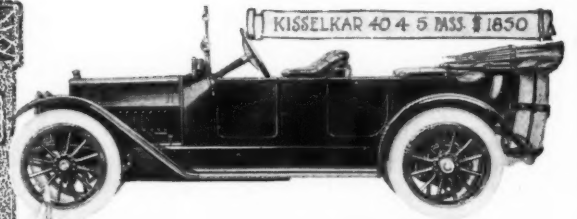
Locomobile 38 LD, four and five passenger, \$4,400. 43.80 H.P., 132 W.B., 36 x 5 tires.	125 W.B., 36 x 4 tires.
Packard 2-38, phaeton, \$3,750. 38.40 H.P., 140 W.B., 37 x 5 tires.	Speedwell Series B, \$2,850. 40.90 H.P., 135 W.B., 37 x 5 tires.
Mercer M-35, \$3,000. 32.40 H.P., 124 W.B., 35 x 4 1/2 tires.	Apperson Jackrabbit 6-55, \$2,350. 43.80 H.P., 128 W.B., 37 x 4 1/2 tires.
Pullman, 6-46, four and five passenger, \$2,400. 38.75 H.P., 130 W.B., 36 x 4 1/2 tires.	Palmer-Singer K Brighton Six, \$2,295. 45.00 H.P., 128 W.B., 36 x 4 1/2 tires.
S. & M. 14-48, \$2,500. 33.75 H.P., 130 W.B., 34 x 4 1/2 tires.	DeSoto Six, \$2,185. 38.40 H.P., 132 W.B., 36 x 4 tires.
Franklin 6-30, \$2,300. 31.60 H.P., 120 W.B., 34 x 4 1/2 tires.	Willys-Knight Four, sleeve valve motor.
Chadwick 19, five and seven passenger, \$5,500. 60.00 H.P., 133 W.B., 37 x 5 tires.	Davis 6-50, \$2,150. 33.75 H.P., 128 W.B., 37 x 4 1/2 tires.
Pearless 38-6, four and five passenger torpedo, \$4,300. 38.40 H.P., 135 W.B., 36 x 4 1/2 tires.	Cole 4, \$1,925. 28.90 H.P., 120 W.B., 34 x 4 1/2 tires.
Lozier 77, \$3,250. 36.06 H.P., 127 1/2 W.B., 36 x 4 1/2 tires.	Reo the Fifth R-5, \$1,175. 25.60 H.P., 112 W.B., 34 x 4 tires.
Winton 20, four and five passenger, \$3,250. 48.60 H.P., 130 W.B., 36 x 4 1/2 tires.	Howard 6 Series D, \$2,375. 40.90 H.P., 130 W.B., 36 x 4 1/2 tires.
Garford G-17, \$2,750.	Henderson Six, \$2,285. 33.75 H.P., 126 W.B., 35 x 4 1/2 tires.
Selden 49, \$2,500. 36.10 H.P.,	Pathfinder XIV-A, \$2,185. 27.25 H.P., 120 W.B.
	Imperial 44-6, \$2,000. 33.76 H.P., 126 W.B., 36 x 4 1/2 tires.
	Jackson Majestic, \$1,885. 32.40 H.P., 124 W.B., 36 x 4 tires.

### Five-Passenger Touring Types

THERE are 219 different five-passenger touring cars listed by American makers for 1914, these extending through the entire gamut of prices. Of the cars listing at under \$1,250 there are twenty-nine different models of five-passenger ones. In those cars listing between \$1,250 and \$1,999 (Continued on next page)

Havers 6-44, \$1,985. 33.75 H.P., 122 W.B., 36 x 4 tires.  
 Kisselkar 40-4, \$1,850. 32.40 H.P., 121 W.B., 36 x 4 tires.  
 Spaulding H Pullman sleeping car, \$1,875. 28.90 H.P., 120 W.B., 36 x 4 tires.  
 Case 35, \$1,850. 28.90 H.P., 120 W.B., 35 x 4½ tires.  
 Cadillac 1914, \$1,975. 32.60 H.P., 120 W.B., 36 x 4½ tires.  
 Oakland 6-48, \$1,785. 29.40 H.P., 123½ W.B., 34 x 4½ tires.  
 Glide 36-42, \$1,840. 27.25 H.P., 118 W.B., 34 x 4 tires.  
 Chalmers 24, \$2,175. 38.40 H.P., 132 W.B., 36 x 4½ tires.  
 Chandler 14, \$1,785. 27.40 H.P., 120 W.B., 34 x 4 tires.

Abbott-Detroit K 34-40, \$1,785. 27.25 H.P., 116 W.B., 34 x 4 tires.  
 Correja H, \$1,800. 33.75 H.P., 128 W.B., 34 x 4 tires.  
 Ames 45, \$1,785. 27.25 H.P., 118 W.B., 26 x 4 tires.  
 Mitchell Four, four and five passenger touring, \$1,595. 28.90 H.P., 120 W.B., 36 x 4½ tires.  
 Great Western 1914, four and five passenger touring, \$1,710. 28.90 H.P., 118 W.B., 36 x 4 tires.



KISSELKAR 40-4 5 PASS \$1850



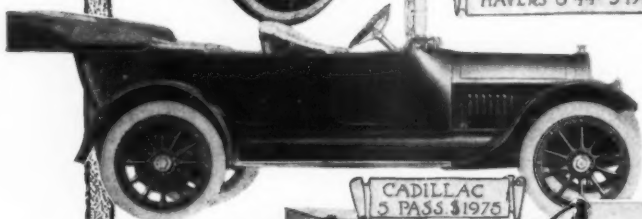
SPAULDING H 5 PASS \$1875



HAVERS 6-44 5 PASS \$1985



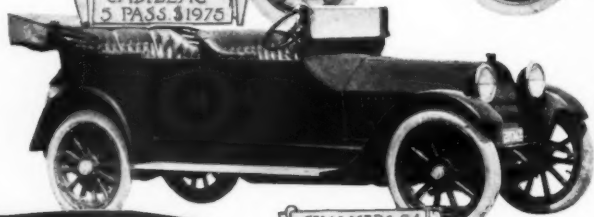
CASE 35 5 PASS \$1850



CADILLAC 5 PASS \$1975



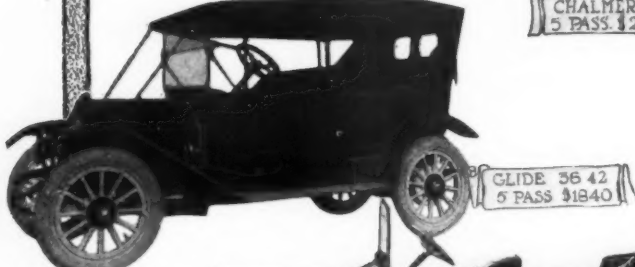
OAKLAND 6-48 5 PASS \$1785



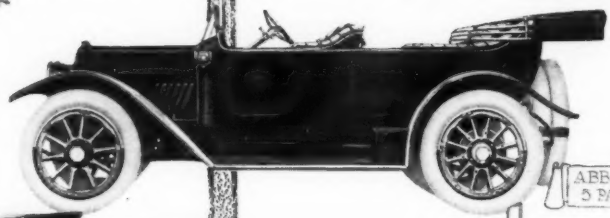
CHALMERS 24 5 PASS \$2175



CHANDLER 14 5 PASS \$1785



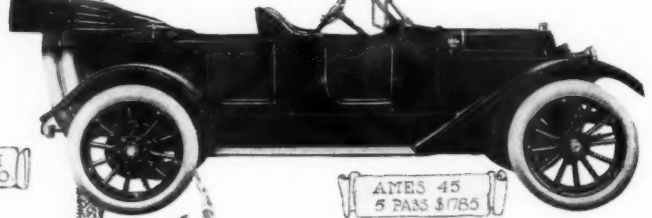
GLIDE 36-42 5 PASS \$1840



ABBOTT K 34-40 5 PASS \$1785



CORREJA H 5 PASS \$1800



AMES 45 5 PASS \$1785



MITCHELL 5 PASS \$1695



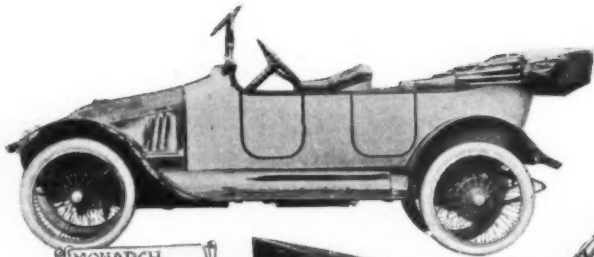
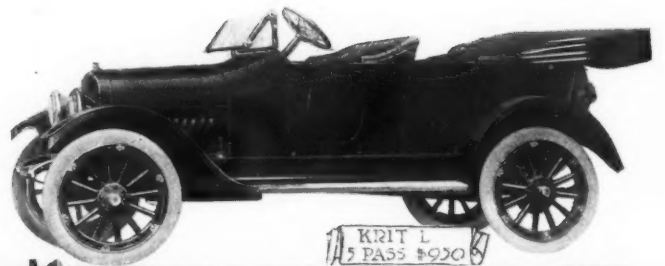
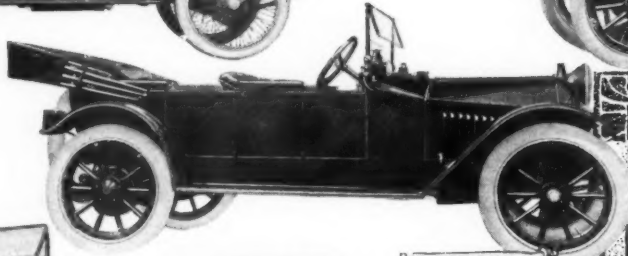
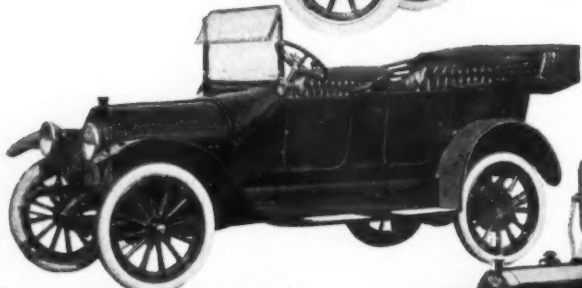
GREAT WESTERN 5 PASS \$1710



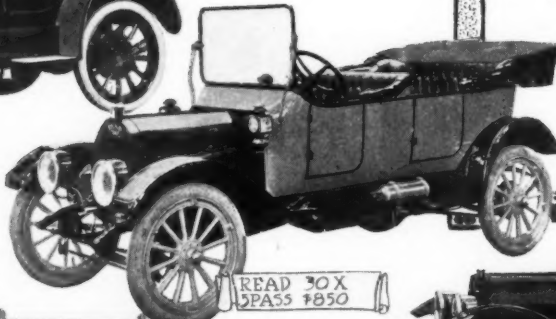
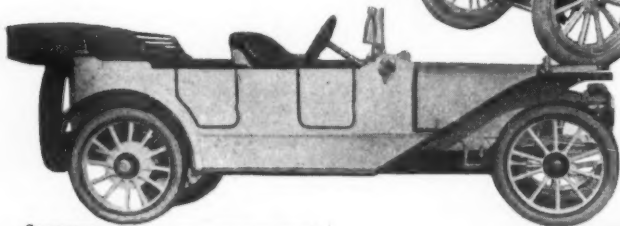
(Continued from preceding page)

there are not fewer than sixty-four five-passenger styles. In the classifications between \$2,000 and \$3,000 there are fifty-three different models for the buyer to select from. In the cars costing over \$3,000 there are seventy-three different five-passenger styles listed. These figures show the enormous popularity of the five-passenger car as compared with either the four, six or seven-passenger styles.

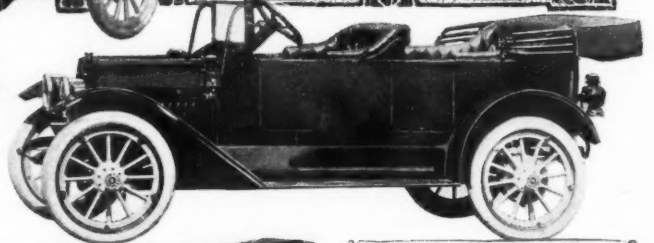
Enger G, with starter, \$1,585. 32.40 H.P., 120 W.B., 24 x 4 tires.	Great Southern 30, \$1,400. 25.60 H.P., 113 W.B., 36 x 4 tires.
Marion B-5, four, \$1,650. 25.60 H.P., 117 W.B., 34 x 4 tires.	Buick B-37, \$1,335. 22.59 H.P., 112 W.B., 34 x 4 tires.
Jeffery 93, \$1,550. 22.50 H.P., 116 W.B., 34 x 4 tires.	Cameron 30, \$1,200. 20.25 H.P., 112 W.B., 34 x 4 tires.
Allen 40, \$1,395. 27.25 H.P., 118 W.B., 34 x 4 tires.	Cartecar, \$1,250. 19.60 H.P., 106 W.B., 32 x 3½ tires.
Ohio 4-35, \$1,275. 28.90 H.P., 116 W.B., 34 x 4 tires.	Vellie 5, 4-35, \$1,550. 25.60 H.P., 113 W.B., 34 x 4 tires.
Corbitt F., \$1,650. 25.60 H.P., 120 W.B., 34 x 4 tires.	Crow-Elkhart D-45, \$1,185. 25.00 H.P., 114 W.B., 33 x 4 tires.
Day Utility D, convertible, \$1,500. 25.60 H.P., 116 W.B., 34 x 4½ tires.	King B, \$1,095. 24.00 H.P., 112 W.B., 33 x 4 tires.

MONARCH  
5 PASS \$1050KRIT L  
5 PASS \$920HUPMOBILE H  
5 PASS \$1050

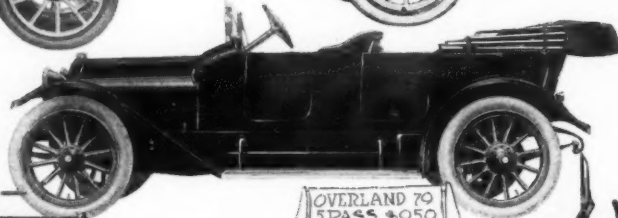
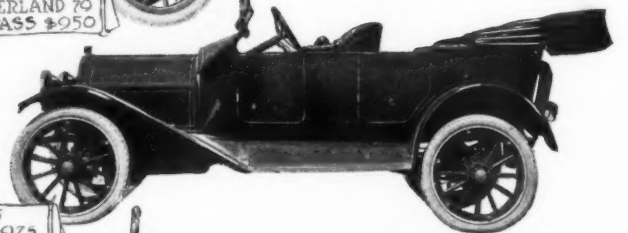
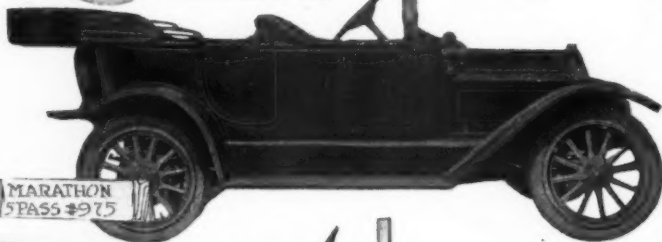
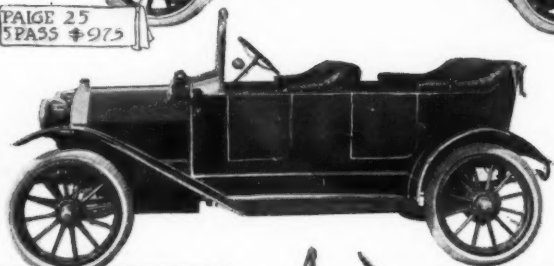
STUDEBAKER 4 5 PASS \$1050

READ 30X  
5 PASS \$850

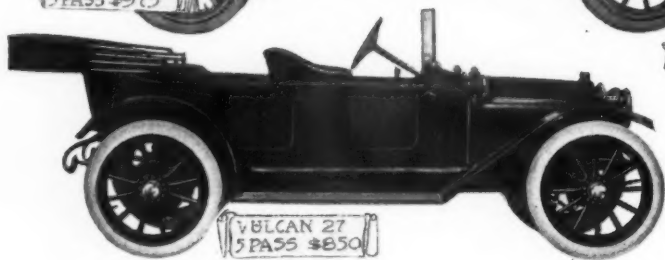
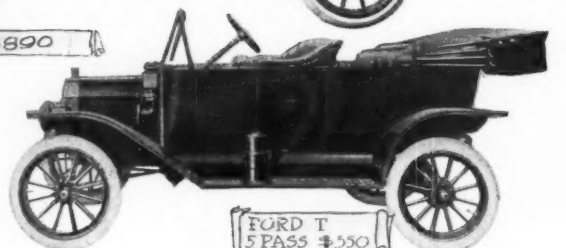
COEY A 5 PASS \$995



EMPIRE 31 5 PASS \$900

OVERLAND 70  
5 PASS \$950DETROITER A  
5 PASS \$900PAIGE 25  
5 PASS \$975MARATHON  
5 PASS \$975

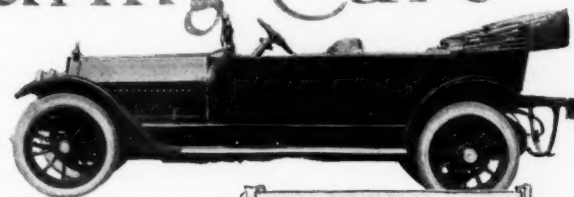
WAHL 5 PASS \$890

VULCAN 27  
5 PASS \$850FORD T  
5 PASS \$550

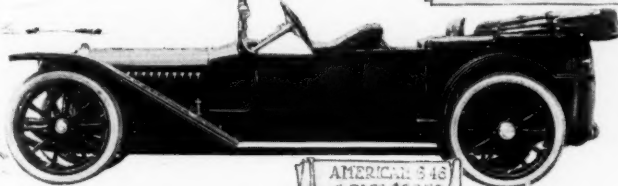
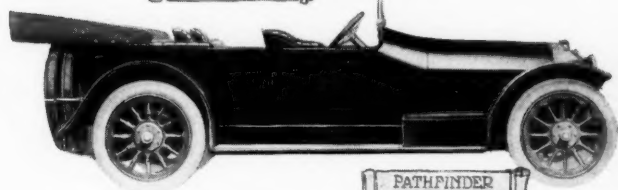
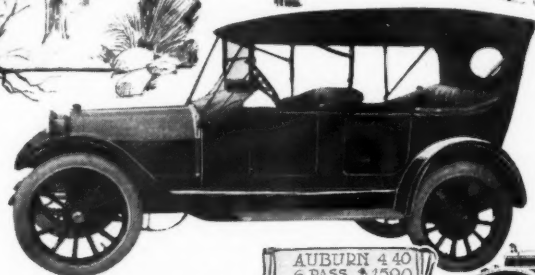
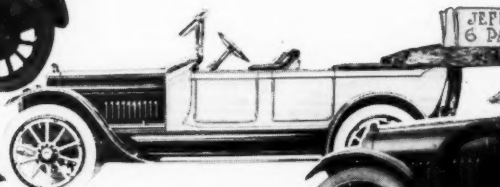
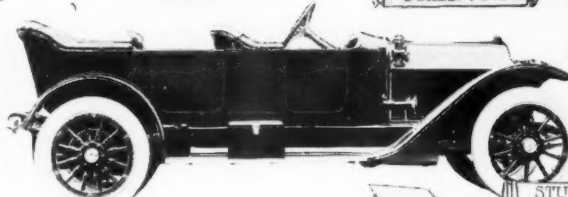
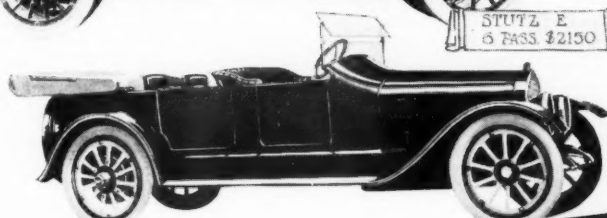
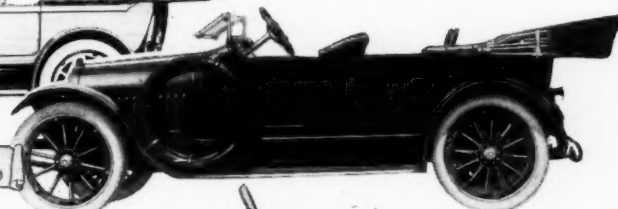
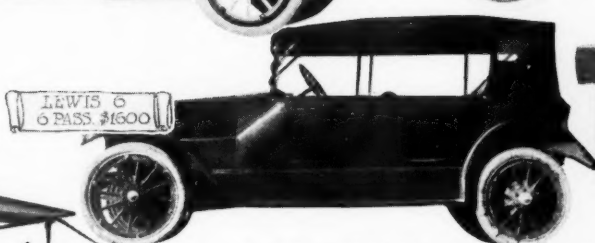
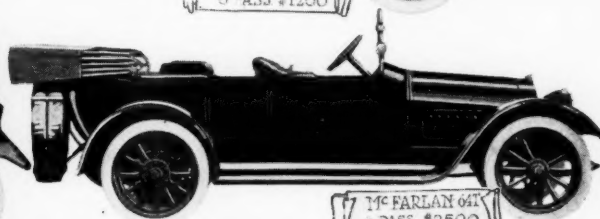
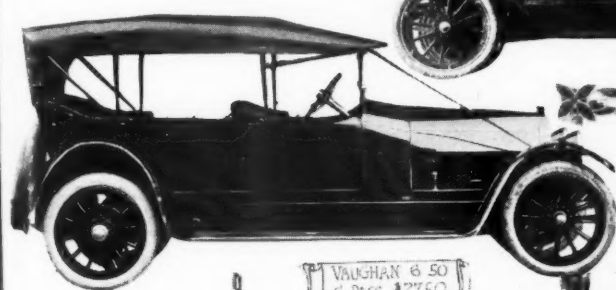
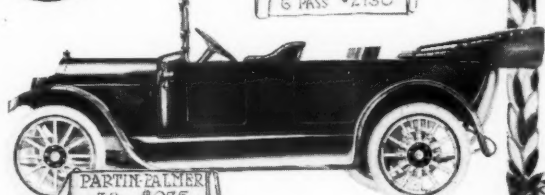
Monarch, with starter and lighting, \$1,050.  
16.27 H.P., 110 W.B., 32 x 3 1/2 tires.  
Hupmobile H, \$1,050. 16.90 H.P., 106 W.B.,  
33 x 4 tires.  
Studebaker Four, \$1,050. 19.60 H.P., 108  
W.B., 32 x 3 1/2 tires.  
Krit L, \$950. 22.50 H.P., 108 W.B., 32 x  
3 1/2 tires.  
Read 30X, \$850. 19.60 H.P., 115 W.B., 32  
x 3 1/2 tires.  
Coey-Special A, \$995. 48.40 H.P., 128 W.B.,  
34 x 4 tires.  
Empire 31, \$900. 22.50 H.P., 109 W.B., 32  
x 3 1/2 tires.  
Detroit A, \$900. 19.60 H.P., 104 W.B., 32  
x 3 1/2 tires.  
Overland 70, \$950. 27.25 H.P., 114  
W.B., 33 x 4 tires.  
Paige 25, \$975. 22.50 H.P., 110 W.B.,  
32 x 3 1/2 tires.  
Marathon Runner, \$975. 19.60 H.P., 104  
W.B., 32 x 3 1/2 tires.  
Vulcan 27, \$850. 18.25 H.P., 105 W.B.,  
32 x 3 1/2 tires.  
Wahl. Price has been raised to \$890.  
Details not yet available.  
Ford T, \$550. 22.50 H.P., 100 W.B.,  
30 x 3 1/2 tires.



# Six Passenger Touring Cars



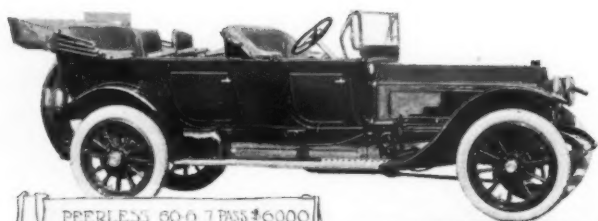
STEARNS-KNIGHT 6 \$5000

AMERICAN 6 48  
6 PASS \$2950PATHFINDER  
6 PASS \$2750AUBURN 4 40  
6 PASS \$1590JEFFERY 6  
6 PASS \$2300STUTZ E  
6 PASS \$2150HUDSON 6  
6 PASS \$1750MOON 6 50  
6 PASS \$2225HUPMOBILE H.M.  
6 PASS \$1200LEWIS 6  
6 PASS \$1600MCFARLAN 6 CY  
6 PASS \$2590VAUGHAN 6 50  
6 PASS \$2750PARTIN-PALMER  
36 \$975

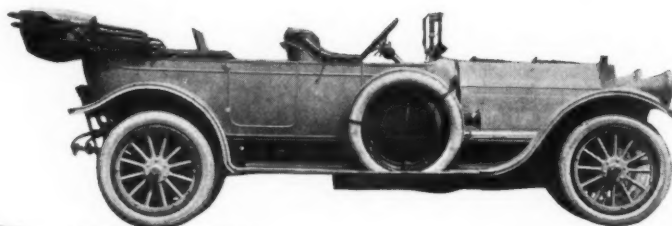
## Six-Passenger Touring Types

Stutz Series 4-E, \$2,150. 35.10 H.P., 130 W.B., 34 x 4 1/2 tires.  
Moon 6-50, four and six passenger, \$2,225. 33.75 H.P., 129 W.B., 35 x 4 1/2 tires.  
Auburn 4-40, \$1,590. 32.40 H.P., 120 W.B., 36 x 4 tires.  
Lewis Six, \$1,600. 29.40 H.P., 135 W.B., 36 x 4 tires.  
Stearns-Knight Six, six and seven passenger, \$3,000. 43.80 H.P., 140 W.B., 37 x 5 tires.  
American 6-46 Underslung, \$2,950.  
Pathfinder Leatherstocking, six and seven passenger, \$2,750. 40.90 H.P., 135 W.B., 35 x 5 tires.  
Hudson Six, phaeton, \$1,750. 29.40 H.P., 123 W.B., 34 x 4 tires.

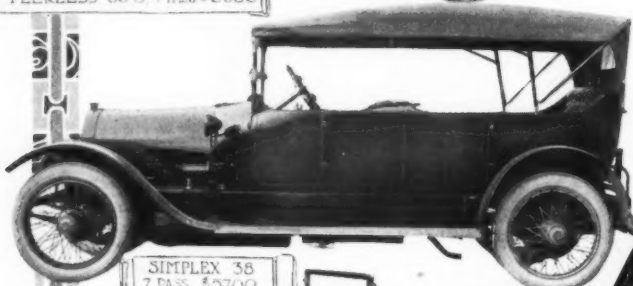
Hupmobile H.M., \$1,200. 16.90 H.P., 106 W.B., 33 x 4 tires.  
McFarlan T, six and seven passenger, \$2,590. 38.40 H.P., 128 W.B., 36 x 4 1/2 tires.  
Partin-Palmer 38, \$975. 115 W.B., 32 x 3 1/2 tires.  
Vaughan, \$2,750. 33.75 H.P., 138 W.B., 35 x 4 1/2 tires.  
Jeffery Six, \$2,300. 33.75 H.P., 128 W.B., 36 x 4 1/2 tires.  
In addition to these, the following makes of six-passenger cars are not illustrated on these pages: Cadillac, Correja, Crow, Davis, Dorris, Hayers, Herreshoff, Holly, Imperial, Lenox, Locomobile, Mondex-Magic, Norwalk, Packard, Rayfield, Winton.



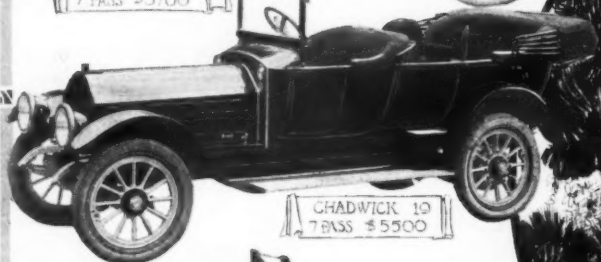
PEERLESS 60-6 7 PASS \$6000



PIERCEARROW  
66 A2 7 PASS \$6000



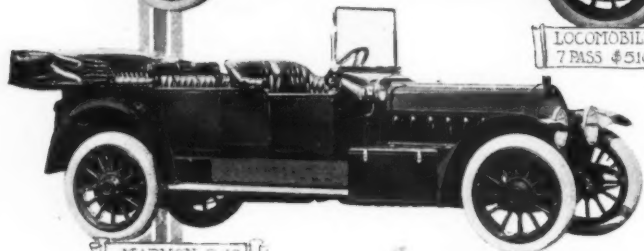
SIMPLEX 38  
7 PASS \$5700



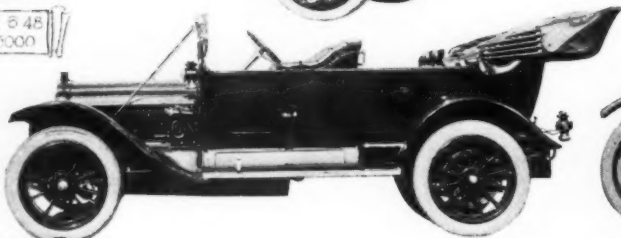
CHADWICK 19  
7 PASS \$5500



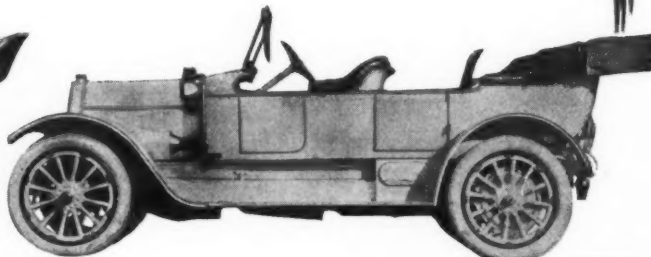
LOCOMOBILE 48  
7 PASS \$5100



MARMION 6-48  
7 PASS \$5000



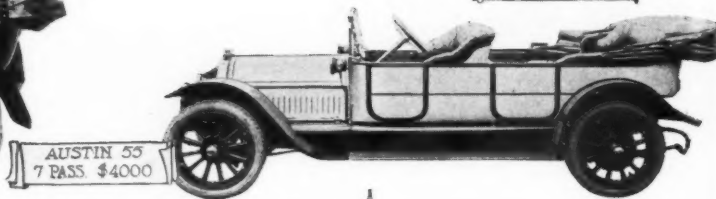
WHITE 6-6F  
7 PASS \$5000



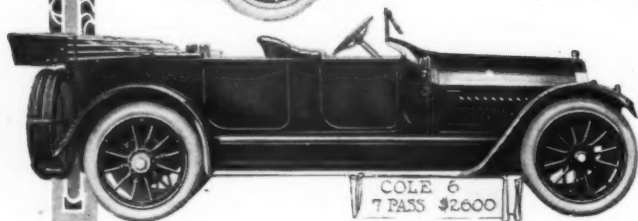
FIAT 55  
7 PASS \$4500



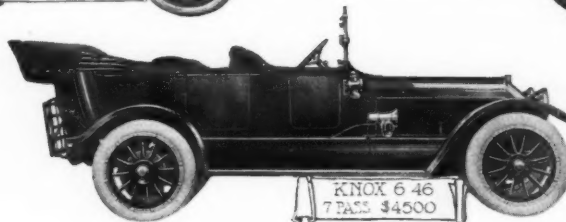
CUNNINGHAM 7  
7 PASS \$3750



AUSTIN 55  
7 PASS \$4000



COLE 6  
7 PASS \$2600



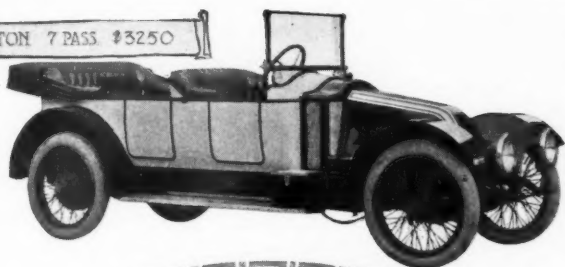
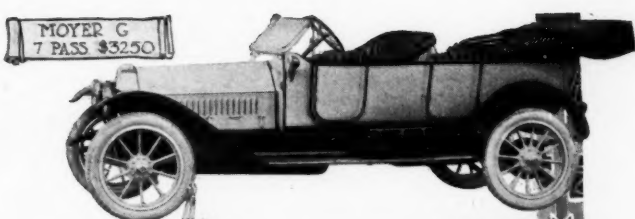
KNOX 6-46  
7 PASS \$4500

## Seven Passenger

For the lovers of the big roomy seven-passenger touring car a wide choice will be found. These cars are all substantial models, built to stand the wear and tear of the roads and are marvels of reliability.



KEETON 7 PASS \$3250

MOYER G  
7 PASS \$3250

# Touring Cars

Fiat 55, five and seven-passenger, \$4,500. 42.00 H.P., 128 W.B., 37 x 5½ tires.

Pierce-Arrow 66 A-2, \$6,000. 60.00 H.P., Optional W.B., 38 x 5½ tires.

Peerless 60-6, six and seven-passenger, \$6,000. 60.00 H.P., 140 W.B., 38 x 5½ tires.

Simplex 38, \$5,700. 38.00 H.P., 138 W.B., 35 x 5 tires.

Chadwick 19, five and seven-passenger, \$5,500. 60.00 H.P., 133 W.B., 37 x 5 tires.

Locomobile 48 LD, left drive, six and seven-passenger, \$5,100. 48.60 H.P., 140 W.B., 37 x 5½ tires.

Marmion six 48, four, five and seven-passenger, \$5,000. 48.60 H.P., 145 W.B., 37 x 5 tires.

White Six G F, five and seven-passenger, \$5,000. 43.80 H.P., 132 W.B., 37 x 5 tires.

Cunningham M, \$3,750. 36.10 H.P., 124 W.B., 36 x 4½ tires.

Cole Six, six and seven-passenger, \$2,600. 43.80 H.P., 136 W.B., 36 x 4½ tires.

Austin 55, five and seven-passenger, \$4,000. 38.40 H.P., 141½ W.B., 37 x 5 tires.

Knox Little Six, 46, six and seven-passenger torpedo, \$4,500. 45.95 H.P., 134 W.B., 38 x 5 tires.

Keeton, \$3,250. 33.75 H.P., 136 W.B., 36 x 4½ tires.

Westcott, six-cylinder, \$2,535. Pilot 60, six and seven-passenger, \$2,785. 38.40 H.P., 132 W.B., 37 x 4½ tires.

Republic Series E, five and seven-passenger, \$2,950. 43.80 H.P., 133 W.B., 36 x 4½ tires.

Speedwell Series H, \$2,950. 40.90 H.P., 135 W.B., 37 x 5 tires.

Havers 6-60, five-passenger, \$2,485. 40.90 H.P., 128 W.B., 36 x 4½ tires.

Moyer G, \$3,250. 48.60 H.P., 135 W.B., 35 x 4½ tires.

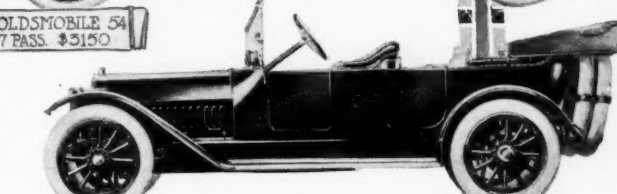
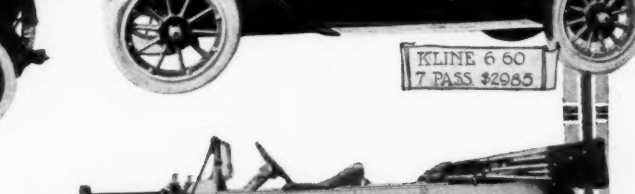
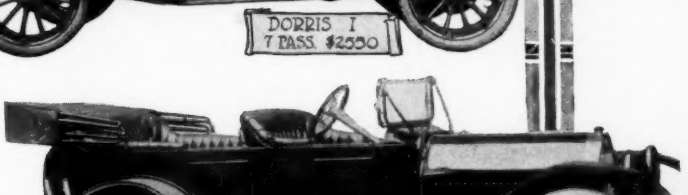
Lyons-Knight K6, \$3,200. 43.80 H.P., 130 W.B., 36 x 5 tires.

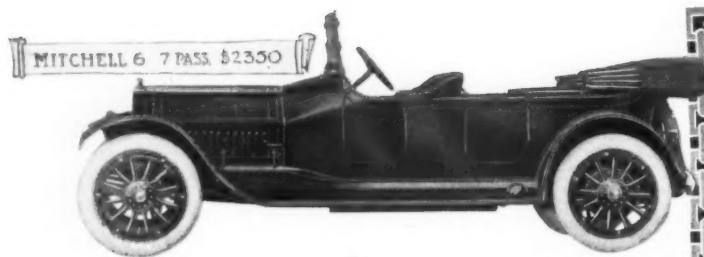
Kisselkar 60-6, \$3,150. 48.60 H.P., 142 W.B., 37 x 5 tires.

Klinekar 6-60, four, six and seven-passenger touring, \$2,985. 44.88 H.P., 133 W.B., 37 x 5 tires.

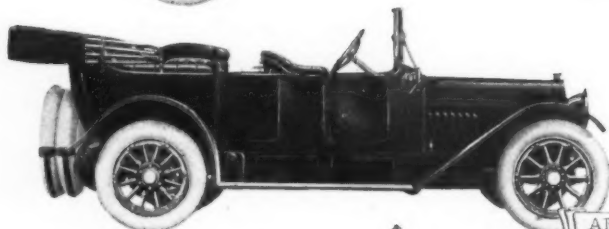
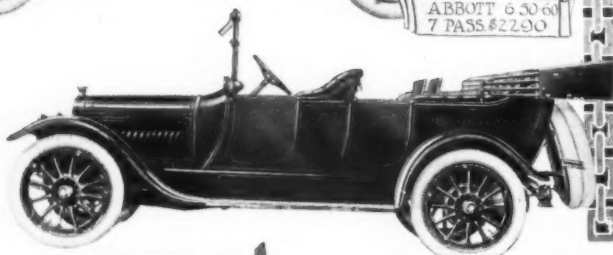
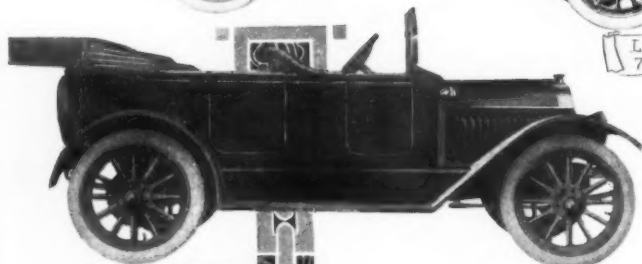
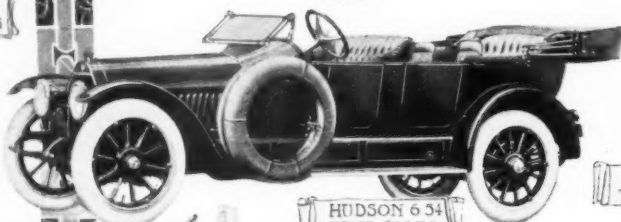
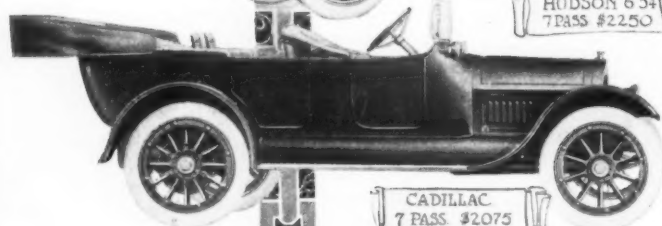
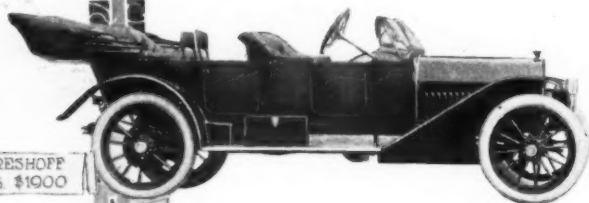
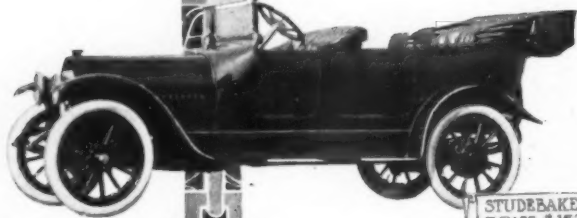
Dorris I, \$2,550. 30.63 H.P., 121 W.B., 36 x 4½ tires.

Case 40, \$2,300. 32.40 H.P., 124 W.B., 37 x 4½ tires.

LYONS-ATLAS, K6  
7 PASS. \$3200OLDSMOBILE 54  
7 PASS. \$3150KISSELKAR 60-6  
7 PASS. \$3150KLINE 6 60  
7 PASS \$2985DORRIS I  
7 PASS \$2550SPEEDWELL C  
7 PASS. \$2950PILOT 60  
7 PASS. \$2785WESTCOTT 6  
7 PASS \$2535HAVERS 6 60  
7 PASS. \$2485CASE 40  
7 PASS \$2300



MITCHELL 6 7 PASS \$2350

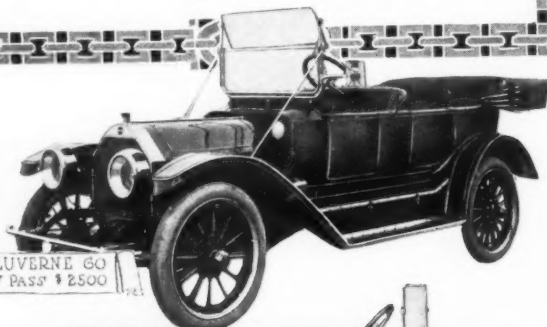
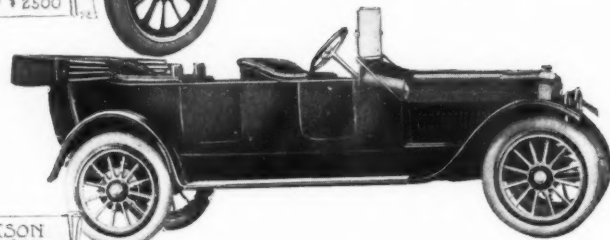
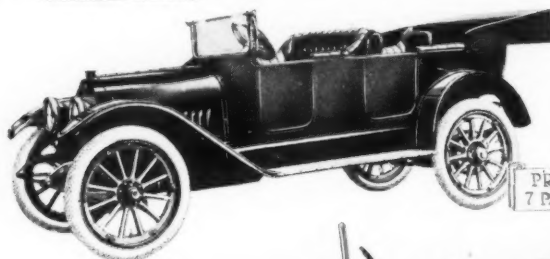
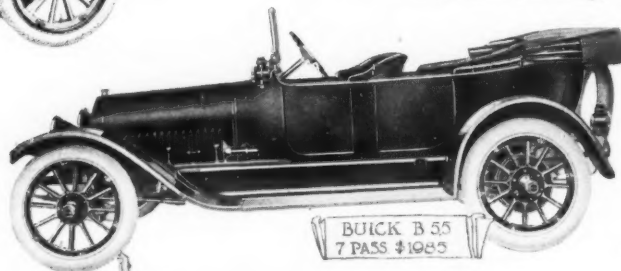
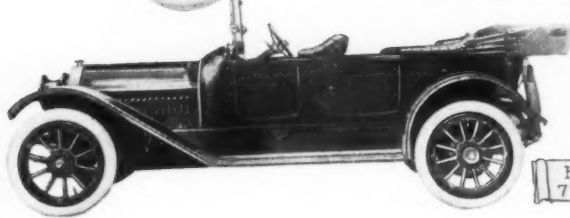
ABBOTT 6 30 60  
7 PASS \$2290LOZIER 34  
7 PASS \$2100MARATHON  
7 PASS \$1495HUDSON 6 34  
7 PASS \$2250CADILLAC  
7 PASS \$2075HERRESHOFF  
7 PASS \$1900STUDEBAKER 6  
7 PASS \$1575

### Touring Car Types

THE most important change in the appearance of touring cars for this year as compared with last is found in the transition between the hood or bonnet and the body. The abrupt break at the dash has been eliminated by the cowl, which forms a continuation of the bonnet and which extends rearward into the streamline body effect. This streamline effect has been accentuated in several makes by leaving off the dash lamps, there being several notable examples.

Mitchell Big Six, \$2,350. 43.80 H.P., 144 W.B., 37 x 5 tires.  
Abbott-Detroit, Belle Isle, \$2,290. 33.75 H.P., 130 W.B., 35 x 4½ tires.  
Lozier 4, Type 34, \$2,100. 28.9 H.P., 120 W.B., 36 x 4½ tires.  
Marathon Champion, \$1,495. 32.60 H.P., 126 W.B., 36 x 4 tires.  
Laverne 7-60, \$2,500. 38.60 H.P., 128 W.B., 37 x 5 tires.  
Hudson Six-54, phaeton, \$2,250. 40.90 H.P., 135 W.B., 36 x 4½ tires.  
Cadillac 1914, \$2,075. 32.60 H.P., 120 W.B., 36 x 4½ tires.  
Herreshoff 6-40, \$1,900. 27.25 H.P., 124 W.B., 34 x 4 tires.  
Studebaker Six, \$1,575. 29.40 H.P., 121 W.B., 34 x 4 tires.  
Jackson Sultanic, \$2,300. 40.90 H.P., 138 W.B., 36 x 4½ tires.  
Pratt 50-D, \$2,300. 32.40 H.P., 122 W.B., 36 x 4 tires.  
Buick B-55, \$1,985. 33.75 H.P., 130 W.B., 36 x 4½ tires.  
Haynes 27, six and seven passenger, \$2,785. 43.80 H.P., 136 W.B., 36 x 4½ tires.

In addition to these the following makes of seven-passenger cars are not illustrated on these pages: Colby, Firestone, Columbus, Holly, Morse, Packard, Pathfinder, Premier, Pullman, S. & M. Spoerer, Staver, Stearns, Winton.

LAVERNE 60  
7 PASS \$2500JACKSON  
7 PASS \$2300PRATT 50 D  
7 PASS \$2300BUICK B 55  
7 PASS \$1985HAYNES 27  
7 PASS \$2785



# Four-Passenger Tourists and Miscellaneous



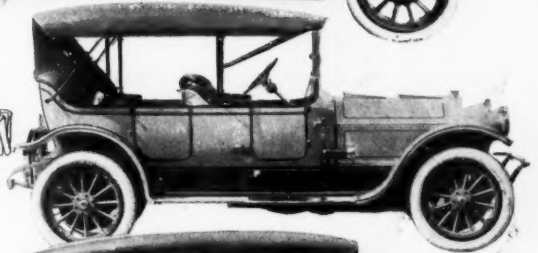
MARMON 48 0  
4 PASS \$2000



CHALMERS 6 24 TORPEDO 4 PASS \$2175



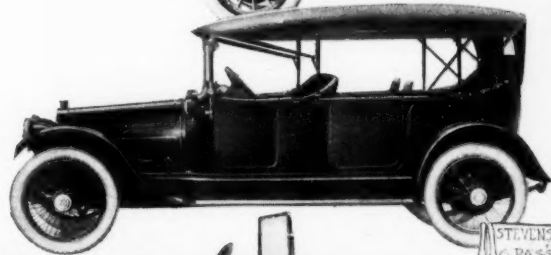
PIERCE-ARROW 48 B-2  
5 PASS \$4800



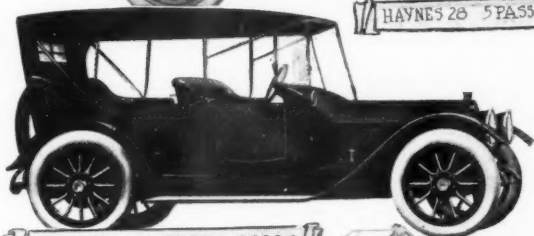
STEVENS-DURYEA C 6  
6 PASS \$5000



HAYNES 28 5 PASS \$1985



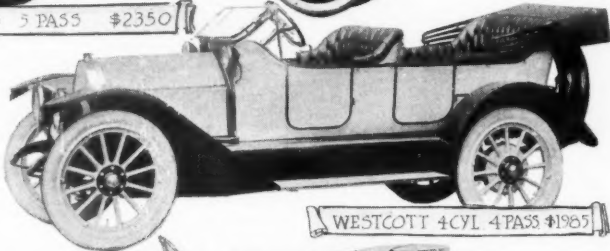
SPEEDWELL A  
5 PASS \$2050



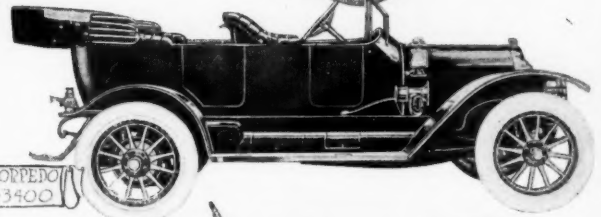
VELLE 10 5 PASS \$2350



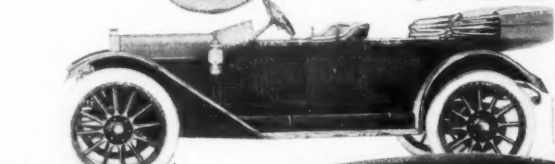
KNOX 44 TORPEDO  
5 PASS \$3400



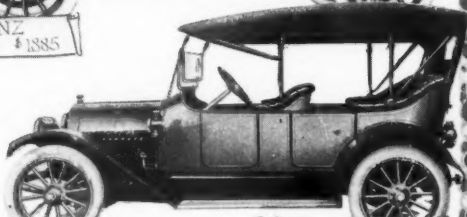
WESTCOTT 4 CYL 4 PASS \$1985



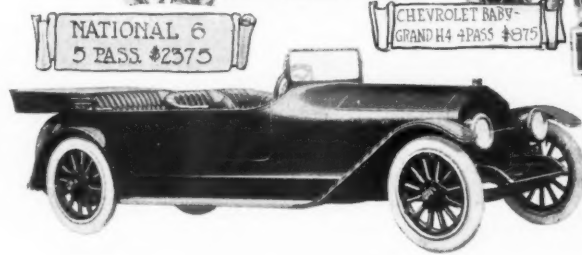
NORWALK D  
4 PASS \$2685



ARBENZ  
4 PASS \$1885



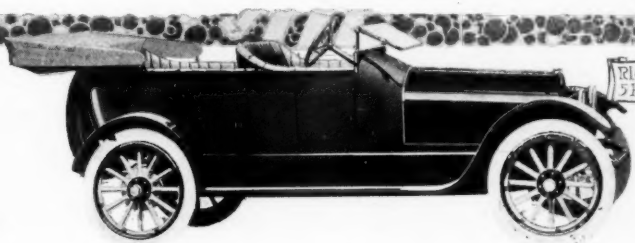
CHEVROLET BABY  
GRAND H-4 4 PASS \$875



NATIONAL 6  
5 PASS \$2375

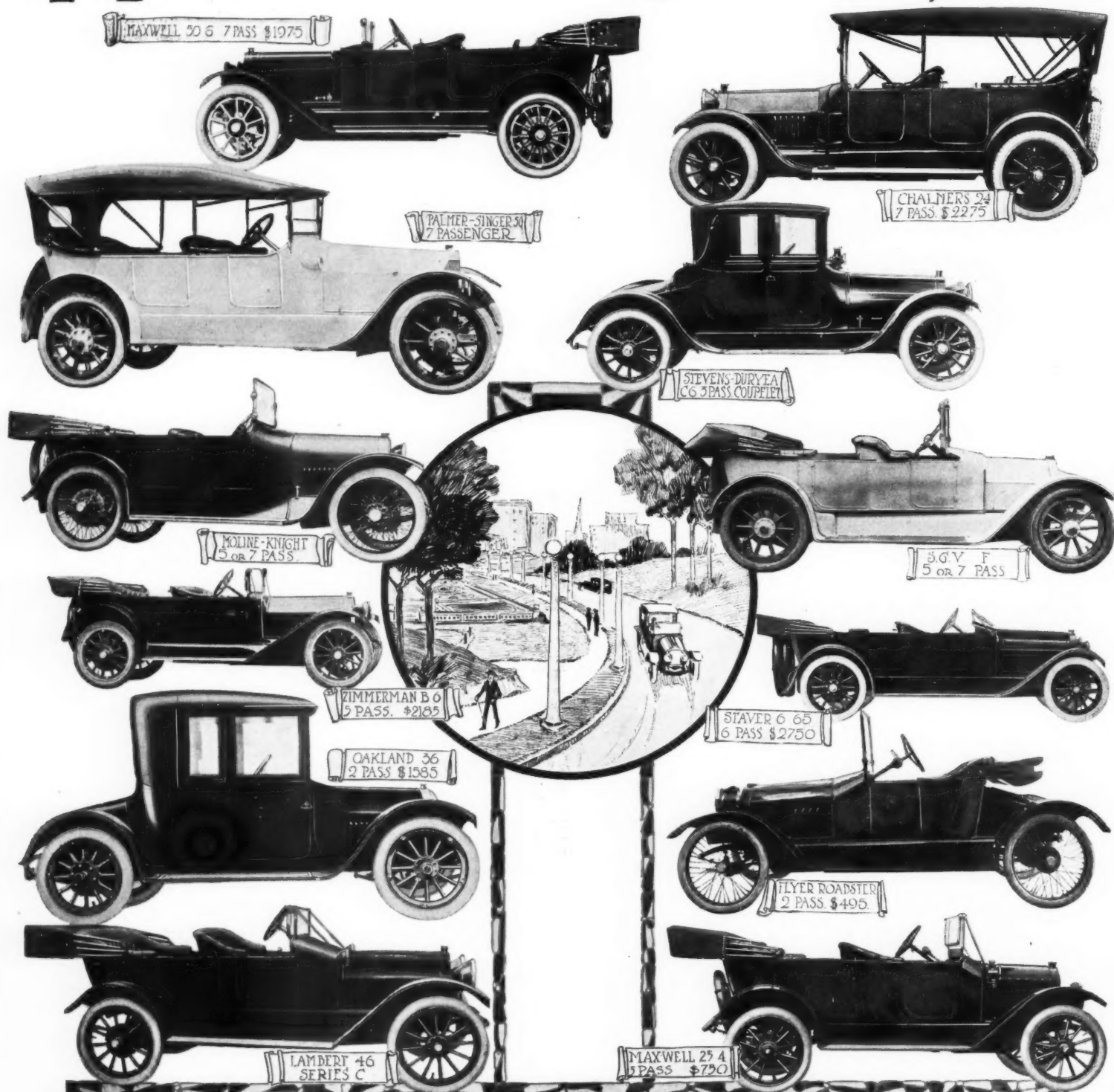
Pierce-Arrow 48 B-2, four-passenger touring, \$4,800. 48.60 H.P.  
Chalmers Six, 24, four-passenger torpedo, \$2,175. 38.40 H.P., 132 W.B.  
Chevrolet Baby Grand H-4, four-passenger touring, \$875. 21.38 H.P., 104 W.B., 32 x 3 1/2 tires.  
Haynes 28-M, five-passenger touring, \$1,985. 28.90 H.P., 118 W.B.  
Knox 44, five-passenger torpedo, \$3,400. 40.00 H.P., optional W.B.  
Marmion 48, four, five and seven-passenger touring, \$5,000. 48.60 H.P.  
Speedwell A, four and five-passenger touring. \$2,850. 40.90 H.P.

Velle 10, four and five-passenger touring, \$2,350. 33.75 H.P., 126 W.B.  
Westcott, four-cylinder, four-passenger, \$1,985.  
Richmond T, five-passenger touring, \$1,500. 38.40 H.P., 123 W.B.  
National Six, five-passenger touring, \$2,375. 33.75 H.P., 132 W.B.  
Stevens-Duryea C 6, six-passenger, \$5,000.  
Arbenz, four-passenger, \$1,885. 27.25 H.P., 120 W.B., 36 x 4 tires.  
Norwalk D, four-passenger touring, \$2,685. Electric gearshift, 36.06 H.P., 131 W.B., 37 x 4 tires.



RICHMOND T 2 6  
5 PASS \$1500

# Miscellaneous Car Types



ON this page are illustrated miscellaneous types of touring cars received too late to be classified in the regular departments. The use of the wire wheel is not so prominent in this illustrated review as might have been expected, due to the difficulty of many makers to procure the wire wheel in large quantities. The lack of wheel manufacturing facilities has greatly hampered wheel progress during the past year. Tires are now generally carried in the rear.

Maxwell 50-6, seven-passenger touring, \$1,975. 40.90 H.P., 130 W.B., 36 x 4½ tires.  
 Palmer-Singer 50, five or seven-passenger touring, \$2,495. 38.40 H.P., 134 W.B., 36 x 4½ tires.  
 Moline-Knight, five or seven-passenger touring, \$2,400. 25.60 H.P., 128 W.B., 36 x 4½ tires.

Zimmerman B-6, five-passenger touring, \$2,185. 38.40 H.P., 120 W.B., 36 x 4 tires.  
 Oakland 36 Cabriolet, two-passenger, \$1,585. 29.40 H.P., 123½ W.B., 35 x 4½ tires.  
 Lambert 46, Series C, four-passenger touring, \$1,200. 22.50 H.P., 112 W.B., 32 x 3½ tires.  
 Chalmers 24, seven-passenger, \$2,275.  
 Stevens-Duryea, C-6, three-passenger coupelet.

S.G.V., four or five-passenger touring, \$3,500. 22.50 H.P., 120 W.B., 35 x 4½ tires.  
 Stayer 6-65, six-passenger touring, \$2,750. 38.40 H.P., 138 W.B., 37 x 4½ tires.  
 Flyer A, two-passenger roadster, \$495. 12.10 H.P., 100 W.B., 28 x 3 tires.  
 Maxwell 25-4, five-passenger touring, \$750. 20.03 H.P., 103 W.B., 30 x 3½ tires.



# The 1914 Automobile and the CHECK BOOK

THERE is no lack of choice in the American automobile field for 1914. Running through the entire price range, one finds that at any reasonable price there is any type of car that can be desired and the purchaser will find that his comfort and convenience have been studied in the cheaper products as well as in the luxurious cars selling for \$7,000 and upwards. There are 135 makers submitting their wares this year and the keen competition has resulted in a remarkable price drop in cars which were formerly out of reach of all but the fairly wealthy. This is especially true of sixes.

As in the past years, the bodies are still fitted to the American chassis and thus we find on the market between 550 and 600 cars which are ready to be driven as soon as they are sold. Only in a few of the higher priced makes are the chassis sold separately and the purchaser may then order any body he sees fit. From the small, two-cylinder runabout selling at \$450 to the \$12,000 limousine the entire car is a well-designed product, the finish and value of the

chassis balancing well with the quality and the appointments of the body fitted to it.

At least one-third of the 250 chassis on the American market today are sixes. These are not confined to the higher-priced classes as last year but now we have them listing well below the \$2,000 mark. In fact one-fifth of the cars selling between \$1,250 and \$2,000 are sixes. This is a six-cylinder year and the lightness and economy of these cars far surpasses the heavy fours that were in many instances turned out by the same makers two or three seasons back.

Another price feature of the year is the fact that makers of cars which have been of exceptionally high price heretofore, have brought out models that are in reach of the medium-priced-car buyer who wishes to secure the product of a high-class factory. One prominent maker does this by building a light four-cylinder model on which the weight and manufacturing expense has been cut to the limit. Another factory of high repute has been able to put out a cheaper car by furnishing a body built in another factory on the standard chassis.

## Motor Cars for 1914 Season Costing Less Than \$1,250

NAME AND MODEL	Body Style and Seating Capacity	Price	No. of Cylinders	S. A. E. H. P.	Wheelbase Inches	Tire Size Inches	Location of Steering
Buick, B-24	Roadster, 2	\$950	4	22.50	105	32x3	Left
Buick, B-25	Touring, 5	1,050	4	22.50	105	32x3	Left
Buick, B-36	Roadster, 2	1,235	4	22.50	112	34x4	Left
Cameron	Runabout, 2	1,200	4	20.25	115	32x3	Left
Cameron	Touring, 5	1,200	4	20.25	115	32x3	Left
Chevrolet, H-2	Roadster, 2	750	4	21.38	104	30x3	Left
Chevrolet, H-4	Touring, 5	875	4	21.38	104	32x3	Left
Coe, A	Touring, 5	995	4	48.40	128	34x4	Right
Continental, 30	Roadster, 2	1,000	4	19.60	110	32x3	Left
Continental, 30	Torpedo, 5	1,000	4	19.60	110	32x3	Left
Crow Elkhart, D-42	Roadster, 2	1,150	4	25.60	114	33x4	Right
Crow Elkhart, D-45	Touring, 5	1,185	4	25.60	114	33x4	Right
Detroit, A-3 and A-4	Roadster, 2	900	4	19.60	104	32x3	Left
Detroit, A-1 and A-2	Touring, 5	900	4	19.60	104	32x3	Left
Detroit, A-5	Roadster, 2	1,025	4	19.60	104	32x3	Left
Detroit, A-6	Touring, 5	1,025	4	19.60	104	32x3	Left
Dispatch, 1914	Roadster, 2	850	4	22.50	120	36x3	Right
Dispatch, 1914	Touring, 5	900	4	22.50	120	36x3	Right
Dispatch, 1914	Coupe, 2	1,000	4	22.50	120	36x3	Right
Duryea	Buggy, 2	450	2		86	44x1 1/2	Center
Duryea	Surrey, 4	500	2		96	44x1 1/2	Center
Empire, 31	Touring, 5	900	4	22.50	109	32x3	Right
Flyer, A	Roadster, 2	495	4	12.10	100	28x3	Left
Ford, T	Roadster, 2	500	4	22.50	100	30x3 1/2	Left
Ford, T	Touring, 5	550	4	22.50	100	30x3 1/2	Left
Ford, T	Town car, 6	750	4	22.50	100	30x3 1/2	Left
Gleason, R	Roadster, 2	850	2	18.00	96	36x2	Right
Gleason, R	Roadster, 3	875	2	18.00	96	36x2	Right
Gleason, R	Touring, 5	1,000	2	18.00	96	36x2	Right
Grant	Roadster, 2	495	4	12.10	90	28x3	Left
Hupmobile, HR	Roadster, 2	1,050	4	16.90	106	33x4	Right
Hupmobile, H	Touring, 5	1,050	4	16.90	106	33x4	Right
Hupmobile, HM	Touring, 6	1,200	4	16.90	106	33x4	Right
King, B	Roadster, 2	1,095	4	24.00	112	33x4	Left
King, B	Touring, 5	1,095	4	24.00	112	33x4	Left
Krit, L	Roadster, 2	\$950	4	22.50	108	32x3	Left
Krit, L	Touring, 5	950	4	22.50	108	32x3	Left
Lambert, 46	Touring, 4	1,200	4	22.50	112	32x3	Left
Marathon, Runner	Roadster, 2	925	4	19.60	104	32x3	Right
Marathon, Runner	Touring, 5	975	4	19.60	104	32x3	Right
Maxwell, 25-4	Touring, 5	750	4	20.25	103	30x3	Left
Maxwell, 35-4	Touring, 5	1,225	4	25.60	110	32x4	Left
Meteor, M-36	Touring, 5	950	4	25.60	116	34x4	Right
Metz	Roadster, 2	475	4	22.50	90	30x3	Left
Monarch	Touring, 5	925	4	16.27	110	32x3	Left
Oakland, 36	Touring, 5	1,200	4	19.60	112	33x4	Left
Overland, 79	Roadster, 2	950	4	27.25	114	33x4	Right
Overland, 79	Touring, 5	950	4	27.25	114	33x4	Right
Paige, 25	Touring, 5	975	4	22.50	110	32x3	Right
Partin-Palmer, 38	Touring, 6	975	4		115	32x3	Left
Paterson, 33	Roadster, 2	1,200	4	19.60	112	32x3	Left
Paterson, 35	Touring, 5	1,235	4	19.60	112	32x3	Left
Read, 30	Touring, 5	850	4	19.60	115	32x3	Left
Regal, T	Touring, 5	1,125	4	22.50	108	32x3	Left
Regal, N	Roadster, 2	1,125	4	22.50	108	32x3	Left
Reo, Fifth	Roadster, 2	1,175	4	25.60	112	34x4	Left
Reo, Fifth	Touring, 5	1,175	4	25.60	112	34x4	Left
Richmond, R	Roadster, 2	1,150	4	27.25	114	34x4	Right
Saxon	Roadster, 2	395	4	11.00	96	28x3	Left
Studebaker, Four	Roadster, 2	1,200	4	19.60	108	32x3	Left
Studebaker, Four	Touring, 5	1,050	4	19.60	108	32x3	Left
Vulcan, 27	Speedster	750	4	18.25	105	32x3	Left
Vulcan, 27	Touring, 5	850	4	18.25	105	32x3	Left
Zimmerman	Roadster, 2	450	2	16.20	80	30x3	Right

\*Rear tires only; front tires are a size smaller

As in the past, the touring body is the most popular for this season. Considering the entire 135 makes, there are 175 five-passenger touring bodies offered. The popularity of the five-passenger touring car is not much greater than that of the run-about seating two or three people, as there are 172 of these including all types such as speedsters, raceabouts, etc. The touring car numbers are brought much higher when the four- six- and seven-passenger bodies are considered. There are sixty-eight of the fours, forty-six of the six and seventy-six of the seven, giving a total of 365 touring cars.

Considering the closed cars, there are in all 203, of which only fifty-eight are coupés having a passenger capacity of two or three. Inclosed cars of a larger seating capacity, including limousines, berlines, landaulets, sedans and various modifications of these general types number 145. In addition to these there are three combination bodies which have appeared during the past year. These are convertible designs in which the car can be transformed from a coupé to a roadster in a very short time.

### Cars Costing Under \$1,250

More can be bought this year for less than \$1,250 than ever before. This class of car selling in the neighborhood of \$1,000 includes at least thirty-five makes. With the range of models offered by these makers, the purchaser has sixty-five different cars from which to make his selection. All of these cars have four cylinders, except two which have two cylinders. The great majority of them are fitted with electric lighting and starting this year. Last year there were but three companies marketing a car of this value which included an electric generator in the equipment. None had electric starters and 61 per cent. used acetylene for lighting.

Six makers are producing cars for \$500 or less this year,

while last year there was but one. The cyclecar is, of course, not considered.

Left drive and center control is used on more than two-thirds of the cars in this class this year, while last year at this time the manufacturers were only just beginning to change over, only five cars then having this type of control.

The average car of this class has a 3.9 by 4.4-inch power plant. Last year the average horsepower rating of this class was 21.51. As an average this year it remains very nearly the same, being 21.4. Last year there was one six in the list, this year none. Block motors in this class continue to increase in popularity but the stroke-bore ratio is less than it was a year ago, being 1.13 as compared to 1.21.

The average wheelbase of the car has increased from 104.2 for 1913 to 107 for 1914. This is in line with the increase in roominess and comfort on all the bodies in not only the cheaper but the higher-priced classes. The cars for this season, even in the \$1,000 class, favor the touring car as there are thirty-three of these having passenger capacities of four or five. There are twenty-eight runabouts, one coupé and one town car. Last year the closed bodies were selling cheaper than they are this year as there are five of them in this class. The demand for electric lighting and starting, especially in bodies of this class has raised the price slightly and cut down the number of closed bodies for this price.

### Cars Costing from \$1,250 to \$1,999

More luxurious upholstery, longer and easier springs, more complete equipment and throughout a better riding and appearing car is given this year for the same money. The cars are all replete with features which make for silence and comfort.

In the \$1,500 class there are fifty-seven makers whereas

## Motor Cars for 1914 Season Costing \$1,250 to \$1,999

NAME AND MODEL	Body Style and Seating Capacity	Price	No. of Cylinders	S. A. E. H. P.	Wheelbase Inches	Tire Size Inches	Location of Steering
Abbott-Detroit, 34-40K	Roadster, 3	\$1,785	4	27.25	116	34x4	Right
Abbott-Detroit, 34-40K	Touring, 5	1,785	4	27.25	116	34x4	Right
Allen, 40	Roadster, 2	1,395	4	27.25	118	34x4	Left
Allen, 40	Touring, 5	1,395	4	27.25	118	34x4	Left
Ames, 45	Roadster, 2	1,745	4	27.25	118	36x4	Left
Ames, 45	Touring, 5	1,785	4	27.25	118	36x4	Left
Apperson, 4-45	Roadster, 2	1,600	4	32.40	116	34x4	Left
Apperson, 4-45	Touring, 5	1,600	4	32.40	116	34x4	Left
Apperson, 4-45	Touring, 5	1,785	4	32.40	120	36x4	Left
Arbenz	Roadster, 2	1,825	4	27.25	120	36x4	Left
Arbenz	Touring, 4 and 5	1,885	4	27.25	120	36x4	Left
Auburn, 4-40	Roadster, 2	1,490	4	32.40	120	36x4	Left
Auburn, 4-40	Touring, 5	1,490	4	32.40	120	36x4	Left
Auburn, 4-40	Coupe, 3 and 4	1,490	4	32.40	120	36x4	Left
Auburn, 4-41	Touring, 6	1,590	4	32.40	120	36x4	Left
Buick, B-37	Touring, 5	1,335	4	22.50	112	34x4	Left
Buick, B-38	Coupe, 3	1,800	4	22.50	112	34x4	Left
Buick, B-55	Touring, 7	1,985	6	33.75	130	36x4½	Left
Cadillac, 1914	Touring, 5	1,975	4	32.60	120	36x4	Right
Cadillac, 1914	Phaeton, 4	1,975	4	32.60	120	36x4½	Right
Cadillac, 1914	Roadster, 2	1,975	4	32.60	120	36x4½	Right
Cartercar, 5	Roadster, 2	1,600	4	27.25	116	36x4	Right
Cartercar, 5	Touring, 5	1,700	4	27.25	116	36x4	Right
Cartercar, 5	Coupe, 3	1,900	4	27.25	116	36x4	Right
Cartercar, 7	Roadster, 2	1,250	4	19.60	106	32x3½	Right
Cartercar, 7	Touring, 5	1,250	4	19.60	106	32x3½	Right
Case, 25	Touring, 5	1,250	4	22.50	110	32x4	Left
Case, 35	Touring, 5	1,850	4	28.90	120	35x4½	Left
Chandler, 14	Touring, 5	1,785	4	27.40	120	34x4	Left
Cole, Four	Roadster, 2	1,925	4	28.90	120	34x4½	Left
Cole, Four	Touring, 5	1,925	4	28.90	120	34x4½	Left
Cole, Four	Touring, 4	1,925	4	28.90	120	34x4½	Left
Continental, 27	Torpedo, 5	1,800	4	32.40	118	34x4	Right
Corbitt, D	Roadster, 2	1,400	4	25.60	120	34x4	Right
Corbitt, E	Touring, 4	1,600	4	25.60	120	34x4	Right
Corbitt, F	Touring, 5	1,650	4	25.60	120	34x4	Right
Correja, H	Roadster, 2	\$1,800	6	33.75	128	34x4	Left
Correja, H	Touring, 5	1,800	6	33.75	128	34x4	Left
Crow Elkhart, D-52	Roadster, 2	1,575	4	28.90	120	34x4	Right
Crow Elkhart, D-54	Touring, 4	1,625	4	28.90	120	34x4	Right
Crow Elkhart, D-55	Touring, 5	1,600	4	28.90	120	34x4	Right
Crow Elkhart, D-56	Touring, 6	1,650	4	28.90	120	34x4	Right
Davis, 35K	Roadster, 2	1,335	4	19.60	112	33x4	Left
Davis, 35J	Touring, 5	1,335	4	19.60	112	33x4	Left
Davis, 50A	Touring, 5	1,985	4	32.40	118	37x4½	Right
Day Utility, D	Convertible, 5	1,500	4	25.60	116	34x4½	Right
Enger, C	Roadster, 2	1,285	4	32.40	120	34x4	Right
Enger, A	Touring, 5	1,285	4	32.40	120	34x4	Right
Fal	Roadster, 2	1,600	4	28.90	116	34x4	Right
Fal	Touring, 4 and 5	1,600	4	28.90	116	34x4	Right
Glide, 36-42	Roadster, 2	1,840	4	27.25	118	34x4	Left
Glide, 36-42	Touring, 5	1,840	4	27.25	118	34x4	Left
Great Southern, 50	Touring, 7	1,750	4	43.05	128	36x4½	Right
Great Western, 1914	Touring, 4 and 5	1,710	4	28.90	118	36x4	Right
Great Western, 1914	Roadster, 2	1,710	4	28.90	118	36x4	Right
Havers, 6-44	Roadster, 2	1,985	6	33.75	122	36x4	Right
Havers, 6-44	Touring, 5	1,985	6	33.75	122	36x4	Right
Haynes, 28-M	Touring, 4 and 5	1,985	4	28.90	118	34x4	Left
Haynes, 28	Roadster, 2	1,985	4	28.90	118	34x4	Left
Henderson, DeLuxe	Roadster, 2	1,785	4	27.25	116	35x4½	Left
Henderson, DeLuxe	Touring, 5	1,585	4	27.25	116	35x4½	Left
Henderson, DeLuxe	Touring, 5	1,785	4	27.25	116	35x4½	Left
Herreshoff, 4-30	Roadster, 2 and 3	1,250	4	18.25	110	32x3½	Left
Herreshoff, 4-30	Touring, 5	1,350	4	18.25	110	32x3½	Left
Herreshoff, 4-30	Coupe, 2	1,650	4	18.25	110	32x3½	Left
Herreshoff, 6-40	Roadster, 2	1,850	6	27.25	124	34x4	Left
Herreshoff, 6-40	Touring, 4, 5 and 6	1,850	6	27.25	124	34x4	Left
Herreshoff, 6-40	Touring, 7	1,900	6	27.25	124	34x4	Left
Hupmobile, 32	Coupe, 3	1,350	4	16.90	106	33x4	Right
Hudson, 6-40	Roadster, 2	1,750	6	29.40	123	34x4	Left
Hudson, 6-40	Phaeton, 6	1,750	6	29.40	123	34x4	Left

\*Rear tires only front tires are a size smaller



# Motor Cars Costing from \$1,250 to \$1,999—Continued

NAME AND MODEL	Body Style and Seating Capacity	Price	No. of Cylinders	S. A. E. H. P.	Wheelbase Inches	Tire Size Inches	Location of Steering
Hudson, 6-40	Cabriolet, 2	\$1,950	6	29.40	123	34x4	Left
Illinois, K-14	Touring, 5	1,400	4	28.90	120	37x4	Right
Imperial, 32	Roadster, 2	1,500	4	28.90	114	34x4	Left
Imperial, 32	Touring, 5	1,500	4	28.90	114	34x4	Left
Imperial, 34	Roadster, 2	1,650	4	32.40	118	34x4	Right
Imperial, 34	Touring, 5	1,650	4	32.40	118	34x4	Right
Jackson, Olympic	Roadster, 2	1,525	4	27.25	115	34x4	Right
Jackson, Olympic	Touring, 5	1,385	4	27.25	115	34x4	Right
Jackson, Majestic	Touring, 5	1,885	4	32.40	124	36x4	Right
Jeffery, 93	Roadster, 2	1,550	4	22.50	116	34x4	Left
Jeffery, 93	Touring, 5	1,550	4	22.50	116	34x4	Left
Jeffery, 93	Couplet, 2	1,950	4	22.50	116	34x4	Left
Kisselkar, 40-4	Roadster, 2	1,850	4	32.40	121	36x4	Left
Kisselkar, 40-4	Touring, 5	1,850	4	32.40	121	36x4	Left
Klinekar, 4-30	Touring, 4 and 5	1,685	4	25.60	125	34x4	Right
Klinekar, 4-40	Runabout, 2	1,985	4	29.71	120	36x4	Left
Klinekar, 4-40	Touring, 4 and 5	1,985	4	29.71	120	36x4	Left
Lambert, 60-C	Touring, 5	1,395	4	27.25	115	34x3 1/2	Right
Lewis, Six	Touring, 6	1,600	6	29.40	135	36x4	Left
Marathon, Winner	Roadster, 2	1,300	4	28.90	118	34x4	Right
Marathon, Winner	Touring, 5	1,325	4	28.90	118	34x4	Right
Marathon, Champion	Roadster, 2	1,470	4	32.60	126	36x4	Right
Marathon, Champion	Touring, 7	1,495	4	32.60	126	36x4	Right
Marion, B	Roadster, 2	1,650	4	25.60	117	34x4	Left
Marion, B	Speedster, 2	1,650	4	25.60	117	34x4	Left
Marion, B	Touring, 5	1,650	4	25.60	117	34x4	Left
Maxwell, 50-6	Touring, 7	1,975	6	40.90	130	36x4 1/2	Optional
Meteor, F-40	Touring, 5	1,275	4	25.60	118	34x3 1/2	Right
Meteor, W	Touring, 5	1,600	6	33.60	122	35x4	Right
Metropol, C	Speedster, 2	1,350	4	28.90	115	33x4	Right
Metropol, C	Touring, 4	1,500	4	28.90	115	33x4	Right
Mitchell, Four	Roadster, 2	\$1,595	4	28.90	120	36x4 1/2	Left
Mitchell, Four	Touring, 4 and 5	1,595	4	28.90	120	36x4 1/2	Left
Mitchell, Six	Roadster, 2	1,895	6	43.80	132	36x4 1/2	Left
Mitchell, Six	Touring, 4 and 5	1,895	6	43.80	132	36x4 1/2	Left
Moon, 42	Roadster, 2	1,750	4	32.40	118	34x4	Left
Moon, 42	Touring, 4 and 5	1,750	4	32.40	118	34x4	Left
Oakland, 36	Cabriolet, 2	1,585	4	19.60	112	33x4	Left
Oakland, M-48	Touring, 5	1,785	6	29.40	123 1/2	35x4 1/2	Left
Ohio, Ohio	Roadster, 2	1,275	4	28.90	116	34x4	Right
Ohio, Ohio	Touring, 5	1,275	4	28.90	116	34x4	Right
Ohio, Royal	Roadster, 2	1,985	6	38.40	132	35x4 1/2	Left
Ohio, Royal	Touring, 5	1,985	6	38.40	132	35x4 1/2	Left
Overland, 79	Coupe, 4	1,550	4	27.25	114	33x4	Right
Paige, 36	Roadster, 3	1,275	4	25.60	116	34x4	Left
Paige, 36	Touring, 5	1,275	4	25.60	116	34x4	Left
Paige, 36	Coupe, 4	1,850	4	25.60	116	34x4	Left
Paige, 36	Sedan, 5	1,950	4	25.60	116	34x4	Left
Pullman, 4-36	Touring, 5	1,575	4	27.10	118	34x4	Optional
Pullman, 4-44	Touring, 5	1,975	4	30.63	122	36x4	Left
Regal, NC	Coupe, 3	1,600	4	22.50	108	33x4	Left
Regal, C	Touring, 5	1,350	4	25.60	116	34x4	Left
Richmond, R	Touring, 5	1,250	4	27.25	114	34x4	Right
Richmond, S	Touring, 5	1,350	4	32.40	117	34x4	Right
Richmond, T	Touring, 5	1,500	6	38.40	123	34x4	Right
Spaulding, H	Touring, 5	1,875	4	28.90	120	36x4	Left
Staver, 45-A	Touring, 5	1,885	4	32.40	120	34x4	Left
Studebaker, Six	Landau Roadster 2	1,950	6	29.40	121	34x4	Left
Studebaker, Six	Touring, 7	1,575	6	29.40	121	34x4	Left
Tribune, A	Touring, 5	1,600	4	28.90	118	34x4	Left
Vellie, 4-35	Touring, 5	1,500	4	25.60	113	34x4	Left

\*Rear tires only; front tires are a size smaller

last year there were eighty-one. The number of models offered in this class covers a wide range as far as different styles go, but there is a marked tendency for the manufacturers in this class to concentrate on one or two chassis, fitting their different bodies to a standardized design. In this class of car are makers who produce in quantity and whose aim is to cut manufacturing costs to the limit and hence the tendency to reduce the number of chassis.

There are 130 different cars offered within this price range and of this number 20 per cent. are sixes. Last year only 11 per cent. were sixes. Outside of the trend towards sixes the power plants have varied but little. There is a small tendency towards the block motor but as far as power goes this year's average is 28.6, while last year it was 28.8 showing but little change in this respect.

Even the wheelbase of this class has changed but little as last

year it was 118.4, while this year it is 118.5, the extra .1 inch being due to the increased number of sixes although the overall length of these is but little in excess of the fours. The average tire size remains the same, 34 by 4.

Last year 80 per cent. of the cars in this class had electric lights but only 52 per cent. used generators, the remainder using storage batteries. This year practically every car of this class is fitted with electric lighting and a large majority with electric cranking although some use air and others fit the starter at a slight additional price.

Considering the body types offered in this class, there are seventy-five touring cars, forty-two roadsters and eleven closed cars. Three of the closed car designs are convertible coupés and roadsters. Last year twelve coupés were offered in this price class.

In the line of body and chassis refinements the same remarks

# Motor Cars for 1914 Costing from \$2,000 to \$2,999

NAME AND MODEL	Body Style and Seating Capacity	Price	No. of Cylinders	S. A. E. H. P.	Wheelbase Inches	Tire Size Inches	Location of Steering
Abbott-Detroit, 34-40, K	Coupe, 4	\$2,250	4	27.25	116	34x4	Right
Abbott-Detroit, 44-50, L	Roadster, 3	2,085	4	32.40	121	36x4 1/2	Right
Abbott-Detroit, 44-50	Touring, 4 and 7	2,085	4	32.40	121	36x4 1/2	Right
Abbott-Detroit, Belle Isle	Roadster, 3	2,290	6	33.75	130	35x4 1/2	Left
Abbott-Detroit, Belle Isle	Touring, 7	2,290	6	33.75	130	35x4 1/2	Left
American, 6-48	Roadster, 2	2,750	6	43.80	140	38x4 1/2	Right
American, 6-46	Touring, 4	2,750	6	43.80	140	38x4 1/2	Right
American, 6-44	Roadster, 2		6	43.35	132	38x4 1/2	Right
American, 6-44	Touring		6	43.35	132	38x4 1/2	Right
Apperson, 4-45	Coupe, 4	2,350	4	32.40	116	34x4	Left
Apperson, 4-45	Sedan, 5	2,500	4	32.40	120	36x4	Left
Apperson, 6-45	Touring, 5	2,200	6	33.75	128	36x4	Left
Apperson, 6-45	Roadster, 2	2,200	6	33.75	120	36x4	Left
Apperson, 6-55	Roadster, 2	\$2,350	6	43.80	120	37x4 1/2	Left
Apperson, 6-55	Touring, 5	2,350	6	43.80	128	37x4 1/2	Left
Auburn, 6-45	Touring, 5	2,000	6	33.75	130	37x4 1/2	Right
Auburn, 6-45	Touring, 6	2,100	6	33.75	130	37x4 1/2	Right
Auburn, 6-45	Roadster, 2	2,000	6	33.75	130	37x4 1/2	Right
Cadillac, 1914	Touring, 7	2,075	4	32.60	120	36x4 1/2	Right
Cadillac, 1914	Coupe, 3	2,500	4	32.60	120	36x4 1/2	Right
Cadillac, 1914	Limousine, 5	2,800	4	32.60	120	36x4 1/2	Right
Cartecar, 5	Sedan, 5	2,000	4	27.25	116	36x4	Right
Case, 40	Touring, 5	2,300	4	32.40	124	37x4 1/2	Right
Case, 40	Touring, 7	2,500	4	32.40	124	37x4 1/2	Right

\*Rear tires only; front tires are a size smaller

# Motor Cars Costing from \$2,000 to \$2,999—Continued

NAME AND MODEL	Body Style and Seating Capacity	Price	No. of Cylinders	S. A. E. H. P.	Wheelbase Inches	Tire Size Inches	Location of Steering
Chalmers, 24	Roadster, 3	\$2,175	6	38.40	132	36x4	Left
Chalmers, 24	Touring, 4 and 5	2,175	6	38.40	132	36x4	Left
Chalmers, 24	Touring, 6	2,275	6	38.40	132	36x4	Left
Chalmers, 24	Coupe, 3	2,350	6	38.40	132	36x4	Left
Colby, 6-C	Roadster, 2	2,500	6	40.90	136	37x5	Right
Colby, 6-C	Touring, 7	2,500	6	40.90	136	37x5	Right
Cole, Four	Coupe, 3	2,350	4	28.90	120	34x4	Left
Cole, Six	Roadster, 2	2,600	6	43.80	136	36x4	Left
Cole, Six	Touring, 6 and 7	2,600	6	43.80	136	36x4	Left
Correja, H.	Touring, 6	2,100	6	33.75	128	34x4	Left
Croxtan	Touring, 4	2,500	4	27.25	121	36x4	Left
Crow-Elkhart, D-62	Roadster, 2	2,225	6	33.75	130	36x4	Right
Crow-Elkhart, D-64	Touring, 4	2,275	6	33.75	130	36x4	Right
Crow-Elkhart, D-65	Touring, 5	2,250	6	33.75	130	36x4	Right
Crow-Elkhart, D-66	Touring, 6	2,300	6	33.75	130	36x4	Right
Davis, 6-50	Touring, 5	2,150	6	33.75	128	37x4	Left
Davis, 6-50	Touring, 6	2,185	6	33.75	128	37x4	Left
DeSoto	Touring, 5	2,185	6	38.40	132	36x4	Optional
Dorris, I	Touring, 4 and 5	2,500	4	30.63	121	36x4	Left
Dorris, I	Touring, 6 and 7	2,550	4	30.63	121	36x4	Left
Fal, Grayhound	Roadster, 2	2,500	4	28.90	114	34x4	Right
Franklin, 6-30	Roadster, 3	2,300	6	31.60	120	34x4	Left
Franklin, 6-30	Touring, 5	2,300	6	31.60	120	34x4	Left
Franklin, 6-30	Coupe, 3	2,950	6	31.60	120	34x4	Left
Havers, 6-60	Roadster, 2	2,485	6	40.90	128	36x4	Right
Havers, 6-60	Touring, 5	2,485	6	40.90	128	36x4	Right
Haynes, 28-P	Coupe, 4	2,700	4	28.90	118	34x4	Left
Haynes, 26	Roadster, 2	2,700	6	43.80	130	36x4	Left
Haynes, 26	Touring, 4 and 5	2,700	6	43.80	130	36x4	Left
Haynes, 27	Touring, 6 and 7	2,785	6	43.80	136	36x4	Left
Henderson, DeLuxe	Coupe, 3	2,285	4	27.25	116	35x4	Left
Henderson, Six	Roadster, 2	2,285	6	33.75	126	35x4	Left
Henderson, Six	Touring, 5	2,285	6	33.75	126	35x4	Left
Henderson, Six	Coupe, 3	2,785	6	33.75	126	35x4	Left
Holly, A-I	Roadster, 2	2,750	6	38.40	130	35x4	Left
Holly, A-I	Touring, 5, 6 & 7	2,750	6	38.40	130	35x4	Left
Howard, D.	Touring, 5	2,375	6	40.90	130	36x4	Left
Hudson, Six-54	Phaeton, 7	2,250	6	40.90	135	36x4	Left
Imperial, 44-6	Touring, 5	2,000	6	33.75	126	36x4	Left
Imperial, 54-6	Touring, 7	2,500	6	40.90	137	36x4	Left
Inter-State, 45	Touring, 5	2,750	6	38.40	132	36x4	Left
Jackson, Sultanic	Touring, 5	2,150	6	40.90	132	36x4	Right
Jackson, Sultanic	Touring, 7	2,300	6	40.90	132	36x4	Right
Jeffery, 93	Sedan, 4	2,350	4	22.50	116	34x4	Left
Jeffery, 96	Roadster, 2	2,250	6	33.75	128	36x4	Left
Jeffery, 96	Touring, 5	2,250	6	33.75	128	36x4	Left
Jeffery, 96	Touring, 6	2,300	6	33.75	128	36x4	Left
Kisselkar, 40-4	Coupe, 5	2,500	4	32.40	121	36x4	Left
Kisselkar, 48-6	Roadster, 2	2,350	6	33.75	132	36x4	Left
Kisselkar, 48-6	Touring, 5	2,350	6	33.75	132	36x4	Left
Klinekar, 6-60	Roadster, 2	2,985	6	44.88	133	37x5	Left
Klinekar, 6-60	Touring, 4, 6 & 7	2,985	6	44.88	133	37x5	Left
Klinekar, 6-60	Coupe, 2	2,985	6	44.88	133	37x5	Left
Klinekar, 4-40	Coupe, 2	2,585	4	29.71	120	36x4	Left
Klinekar, 6-50	Roadster, 2	2,585	6	40.90	128	36x4	Left
Klinekar, 6-50	Touring, 4 and 5	2,585	6	40.90	128	36x4	Left
Klinekar, 6-60	Touring, 4, 6 & 7	2,985	6	44.88	133	37x5	Left
Klinekar, 6-60	Coupe, 2	2,985	6	44.88	133	37x5	Left
Klinekar, 6-60	Runabout, 2	2,985	6	44.88	133	37x5	Left
Lenox, D.	Roadster, 2	2,100	4	28.90	118	34x4	Left
Lenox, C	Roadster, 3	2,000	4	28.90	118	34x4	Left
Lenox, A & B	Touring, 4 and 5	2,000	4	28.90	118	34x4	Left
Lenox, M & N	Touring, 4 and 6	2,750	6	38.60	130	34x4	Left
Lozier, Four	Roadster, 2		4	28.90	120	36x4	Left
Lozier, Four	Touring, 5 and 7		4	28.90	120	36x4	Left
Luvrens, 7-60	Touring, 7	2,500	6	38.60	130	36x4	Left
Lyons-Knight, K-4	Touring, 5	2,900	4	32.40	130	37x5	Left
Lyons-Knight, K-4	Touring, 7	2,980	4	32.40	130	37x5	Left
Marion, G	Roadster, 2	2,150	6	33.75	124	35x4	Left
Marion, G	Touring, 5	2,150	6	33.75	124	35x4	Left
Marion, G	Coupe, 4	2,650	6	33.75	124	35x4	Left
Marion, G	Sedan, 5	2,950	6	33.75	124	35x4	Left
Marion, B	Coupe, 4	2,150	4	25.60	117	34x4	Left
Marmion, 32	Speedster, 2	2,850	4	32.40	120	35x4	Left
Marmion, 32	Roadster, 2	2,900	4	32.40	120	35x4	Left
McFarlan, T	Roadster, 2	2,590	6	38.40	128	36x4	Left
McFarlan, T	Touring, 4 and 5	2,590	6	38.40	128	36x4	Left
McFarlan, T	Touring, 6 and 7	2,590	6	38.40	128	36x4	Left
Mercer, J	Runabout, 2	\$2,600	4	30.63	108	32x4	Right
Mercer, H	Touring, 5	2,900	4	32.40	118	34x4	Right
Mercer, O	Runabout, 2	2,900	4	32.40	118	34x4	Right
Mitchell, Big Six	Touring, 7	2,350	6	43.80	144	37x5	Left
Moline, Knight	Touring, 5 and 7	2,400	4	25.60	128	36x4	Left
Moon, 42	Coupe, 3	2,250	4	32.40	118	34x4	Left
Moon, 6-50	Roadster, 2	2,150	6	33.75	129	35x4	Left
Moon, 6-50	Touring, 5	2,150	6	33.75	129	35x4	Left
Moon, 6-50	Touring, 4 and 6	2,225	6	33.75	129	35x4	Left
Moon, 6-50	Coupe, 3	2,750	6	33.75	129	35x4	Left
Moyer, E.	Roadster, 2	2,400	4	32.40	121	34x4	Right
Moyer, E.	Touring, 5	2,500	4	32.40	121	34x4	Right
National, 40	Roadster, 2	2,750	4	38.00	120	36x4	Left
National, Six	Touring, 4 and 5	2,375	6	33.75	132	36x4	Left
Norwalk, D.	Roadster, 2	2,685	6	36.06	131	37x4	Left
Norwalk, D.	Touring, 4	2,685	6	36.06	131	37x4	Left
Norwalk, D.	Touring, 6	2,785	6	36.06	131	37x4	Left
Oldsmobile, 54	Touring, 5	2,975	6	43.80	132	36x5	Right
Palmer-Singer	Runabout, 2	2,295	6	38.40	128	36x4	Right
Palmer-Singer	Touring, 5	2,295	6	38.40	128	36x4	Right
Palmer-Singer, 50	Roadster, 2	2,495	6	38.40	134	36x4	Left
Palmer-Singer, 50	Touring, 5	2,495	6	38.40	134	36x4	Left
Pathfinder, 14	Roadster, 2	2,160	4	27.25	120	35x4	Right
Pathfinder, 14	Cruiser, 2	2,175	4	27.25	120	35x4	Right
Pathfinder, 14	Touring, 5	2,185	4	27.25	120	35x4	Right
Pathfinder, 14	Coach, 3	2,500	4	27.25	120	35x4	Right
Pathfinder, Leather Stock	Touring, 6 and 7	2,750	6	40.90	135	35x5	Left
Pilot, 50	Roadster, 2	2,250	4	32.40	120	37x4	Optional
Pilot, 50	Touring, 5	2,250	4	32.40	120	37x4	Optional
Pilot, 50	Roadster, 2	2,500	4	32.40	126	37x4	Optional
Pilot, 50	Touring, 4 and 5	2,500	4	32.40	126	37x4	Optional
Pilot, 50	Touring, 6 and 7	2,500	4	32.40	126	37x4	Optional
Pilot, 60	Roadster, 2	2,785	6	38.40	132	37x4	Optional
Pilot, 60	Touring, 4 and 5	2,785	6	38.40	132	37x4	Optional
Pilot, 60	Touring, 6 and 7	2,785	6	38.40	132	37x4	Optional
Pope-Hartford, 35	Roadster, 2	2,250	4	29.76	118	36x4	Left
Pope-Hartford, 35	Touring, 5	2,250	4	29.76	118	36x4	Left
Pratt, 4-50	Roadster, 2	2,100	4	32.40	122	36x4	Right
Pratt, 4-50	Touring, 4 and 5	2,150	4	32.40	122	36x4	Right
Pratt, 4-50	Touring, 7	2,300	4	32.40	122	36x4	Right
Premier	Roadster, 2		6	31.60	132	36x4	Left
Premier	Touring, 5		6	31.60	132	36x4	Left
Premier, 6-48	Roadster, 2	2,785	6	38.40	132	36x4	Left
Premier, 6-48	Touring, 5	2,785	6	38.40	132	36x4	Left
Premier, 6-48	Touring, 7	2,900	6	38.40	132	36x4	Left
Pullman, 6-68	Touring, 7	2,850	6	45.95	138	37x5	Left
Pullman, 6-68	Touring, 4 and 5	2,400	6	35.75	130	36x4	Left
Rayfield, D	Roadster, 2	2,600	6	38.40	130	36x4	Right
Rayfield, D	Touring, 4, 5 and 6	2,600	6	38.40	130	36x4	Right
Rayfield, D	Coupe	2,750	6	38.40	130	36x4	Right
Republic	Touring, 5 and 7	2,950	6	43.80	133	36x4	Left
S. & M., 14-48	Roadster, 2	2,485	6	33.75	130	34x4	Left
S. & M., 14-48	Touring, 5	2,485	6	33.75	130	34x4	Left
S. & M., 14-48	Touring, 7	2,535	6	33.75	130	34x4	Left
Selden, 49	Runabout, 3	2,500	4	36.10	125	36x4	Right
Selden, 49	Touring, 5	2,500	4	36.10	125	36x4	Right
Speedwell, H	Touring, 4 and 5	2,850	6	40.90	135	37x5	Left
Speedwell, H	Touring, 7	2,950	6	40.90	135	37x5	Left
Staver, 65-A	Touring, 7	2,550	6	38.40	138	37x4	Left
Studebaker, Six	Sedan, 5	2,250	6	29.40	121	34x4	Left
Stutz, 4-E	Touring, 6	2,150	4	35.10	130	34x4	Right
Stutz, 4-E	Roadster, 2	2,000	4	36.10	120	36x4	Right
Stutz, 4-E	Bearcat, 2	2,000	4	36.10	120	36x4	Right
Stutz, 4-E	Coupe, 3	2,600	4	36.10	120	36x4	Right
Stutz, 4-E	Touring, 6	2,400	6	38.40	130	34x4	Right
Stutz, 6-E	Roadster, 2	2,250	6	38.40	120	34x4	Right
Stutz, 6-E	Bearcat, 2	2,250	6	38.40	120	34x4	Right
Stutz, 6-E	Coupe, 3	2,850	6	38.40	120	34x4	Right
Vaughan	Roadster, 2	2,850	6	33.75	138	35x4	Left
Vaughan	Touring, 6	2,800	6	33.75	138	35x4	Left
Vaughan	Touring, 4	2,750	6	33.75	138	35x4	Left
Vellie, 4-45	Roadster, 2	2,000	4	34.25	121	36x4	Left
Vellie, 4-45	Touring, 4 and 5	2,000	4	34.25	121	36x4	Left
Vellie, 5-50	Roadster, 2	2,350	6	33.75	126	37x4	Left
Vellie, 5-50	Touring, 4 and 5	2,350	6	33.75	126	37x4	Left
White, G. A. F.	Roadster, 2	2,500	4	22.50	110	34x4	Left
White, G. A. F.	Touring, 5	2,500	4	22.50	110	34x4	Left
Willis-Knight	Roadster, 2		4	25.60	120	36x4	Left
Willis-Knight	Touring, 5		4	25.60	120	36x4	Left
Zimmerman, B-6	Touring	2,185	6	38.40	132	36x4	Optional

\*Rear tires only; front tires are



hold true in this class as in all others. The cars have, on the whole, been made more easy riding. The springs have been given marked attention and the upholstery as a general rule is deeper. Left drive is offered on 60 per cent. of the cars and many are offering the purchaser a choice of either left or right drive. In 95 per cent. of the cars using left drive this year center control is used. In the exceptions the electric gearshift, center brake and left gearshift or entire left control is used. Many makers formerly in this class have introduced sixes and gone up in price.

**Automobiles Selling from \$2,000 to \$2,999**

The so-called \$2,500 class, which includes the cars selling from \$2,000 up to the \$3,000 mark, comprises sixty makers who are marketing a choice of 170 different cars. This price includes some of the closed body types of the cheaper cars, and altogether there are nineteen of these. The touring cars number seventy-one and the roadsters forty-four.

This is the class that includes the low-price six and for that reason many new entries which have been recruited from other price classifications are to be noted among the new arrivals in this class. No fewer than 111 makers of this price car use six-cylinder motors and fifty-nine use the four. The average car of this class would sell for about \$2,460. The chances are two to one that it would have a six-cylinder motor 3.07 by 5.25-inch dimensions and rated at 35.22 horsepower. The wheelbase would be about 125.8 inches and the tires 35 by 4.5. Last year the cars in this class were evenly divided as regards sixes and fours. There were fifty-three fours and forty-seven sixes, the slight difference that occurred being in favor of the four. This year it is the six that leads. There are eleven more makes of cars in this class than there were last year.

As the tables show, but very few cars in this class are fitted with right drive or right control, the big majority favoring left drive and center control. Last year but twenty-one makers had adopted the left drive in this class. Many are fitted with either left and right drive at the option of the purchaser.

Only 57 per cent. of the cars of this class were fitted with

electric lighting last year and only a moderate percentage of those had the electric cranking feature. Many of those that had electrically started cars on exhibition at the shows had put them on at the last minute so they did not really represent practice in this direction. Over 95 per cent. have both electric light and electric cranking this year.

### Cars Costing Above \$3,000

American stock models list as high as \$8,000 for a chassis alone and between \$3,000 and this figure there is a range of choice as wide as the pocketbook can stand. No less than 250 stock models represent this price class, showing an average of about six models for each of the forty-six different factories. More than one-half of the bodies offered are of the closed variety and many makers whose names appear in lower price classifications are listed here with a line of limousines, sedans, berlines, etc. There are sixty-two touring cars and twenty-eight roadsters listed. The remaining 128 are inclosed.

The big feature of this price car is the fashionable body design. The average car would show a molded streamline type in which the lines were all carried with the smoothness and easy curvature that generally features marine design. The idea of the design is a suggestion of dignity and yet speed, luxuriousness and raciness combined in an artistic ensemble.

It is in these high-priced cars that the full development of the streamline form is to be found. The body work in this line is characterized by long sweeping curves which are not broken into at any parts of the body. In the closed cars the curved roofs and the wide windows give a rich appearance which far exceeds anything that America has produced heretofore in the line of artistic body work. What is a great point to be considered when the bodies are compared with the foreign ones is that they are built and sold with the chassis and not the subject of personal study by the buyer.

Two-thirds of these cars have power plants that include six-cylinders. The wheelbase of the average car would measure 132 inches and the motor would be rated at 40.5 horsepower. The tires would be 36 by 5.

## Motor Cars for 1914 Season Costing More Than \$3,000

NAME AND MODEL	Body Style and Seating Capacity	Price	No. of Cylinders	S. A. E. H. P.	Wheelbase Inches	Tire Size Inches	Location of Steering
Abbott-Detroit, 44-50 L	Limousine, 7	\$3,150	4	32.40	121	36x4 1/2	Right
Abbott-Detroit, Belle Isle	Limousine, 7	3,500	6	33.75	130	35x4 1/2	Left
Austin, 55	Runabout, 2	4,000	4	38.40	141 1/2	37x5	Left
Austin, 55	Touring, 5 and 7	4,000	4	38.40	141 1/2	37x5	Left
Austin, 55	Limousine, 7	5,000	4	38.40	141 1/2	37x5	Left
Austin, 77	Runabout, 2	6,000	6	48.60	141 1/2	37x5	Left
Austin, 77	Touring, 5 and 7	6,000	6	48.60	141 1/2	37x5	Left
Austin, 77	Limousine, 7	7,000	6	48.60	141 1/2	37x5	Left
Cadillac, 1914	Limousine, 7	3,250	4	32.60	120	36x4 1/2	Right
Chadwick, 19	Roadster, 2	5,500	6	60.00	112	36x4 1/2	Right
Chadwick, 19	Touring, 5 and 7	5,500	6	60.00	133	37x5 1/2	Right
Chadwick, 19	Limousines, 7	6,500	6	60.00	133	37x5 1/2	Right
Chalmers, 24	Limousine, 7	3,600	6	38.40	132	36x4 1/2	Left
Cole, Six	Coupe, 4	3,000	6	43.80	136	36x4 1/2	Left
Cole, Six	Limousine, 7	4,000	6	43.80	136	36x4 1/2	Left
Crane, 4	Chassis only	8,000	6	45.95	136 1/2	37x5 1/2	Left
Cunningham, M.	Runabout, 2	3,500	4	36.10	124	36x4 1/2	Left
Cunningham, M.	Touring, 4 & 5	3,750	4	36.10	124	36x4 1/2	Left
Cunningham, M.	Touring, 7	3,750	4	36.10	124	36x4 1/2	Left
Cunningham, M.	Limousine, 7	4,900	4	36.10	124	36x4 1/2	Left
Cunningham, M.	Landulet, 7	5,000	4	36.10	124	36x4 1/2	Left
Cunningham, M.	Berline, 7	5,000	4	36.10	124	36x4 1/2	Left
Dorris, I	Limousine, 7	3,000	4	30.63	121	36x4	Left
Fiat, 54	Touring, 5 and 7	4,000	4	30.00	123	36x4 1/2	Right
Fiat, 54	Roadster, 2 and 3	4,000	4	30.00	123	36x4 1/2	Right
Fiat, 54	Limousine, 7	5,000	4	30.00	123	36x4 1/2	Right
Fiat, 54	Landulet, 7	5,100	4	30.00	123	36x4 1/2	Right
Fiat, 54	Berline, 7	5,300	4	30.00	123	36x4 1/2	Right
Fiat, 55	Touring, 5 and 7	4,500	4	42.00	128	37x5 1/2	Right
Fiat, 55	Roadster, 3	4,500	4	42.00	128	37x5 1/2	Right
Fiat, 55	Limousine, 7	5,500	4	42.00	128	37x5 1/2	Right
Ford, 1914	Runabout, 2	3,500	4	38.40	141 1/2	37x5	Left
Ford, 1914	Touring, 5 and 7	3,500	4	38.40	141 1/2	37x5	Left
Ford, 1914	Limousine, 7	4,500	4	38.40	141 1/2	37x5	Left
Ford, 1914	Landulet, 7	5,000	4	38.40	141 1/2	37x5	Left
Ford, 1914	Berline, 7	5,000	4	38.40	141 1/2	37x5	Left
Franklin, 6-30	Sedan, 5	3,200	6	31.60	120	34x4 1/2	Left
Franklin, 6-30	Limousine, 5	3,300	6	31.60	120	34x4 1/2	Left
Franklin, 6-30	Berlin, 5	3,400	6	31.60	120	34x4 1/2	Left
Great Eagle, B	Touring, 7	3,500	4	36.10	135	37x5 1/2	Left
Great Eagle, B	Limousine, 7	4,000	4	36.10	135	37x5 1/2	Left
Great Eagle, B	Limousine, 10	4,250	4	36.10	135	37x5 1/2	Left
Haynes, 26P	Coupe, 4	3,200	6	43.80	130	36x4 1/2	Left
Haynes, 27L	Limousine, 7	3,850	6	43.80	136	36x4 1/2	Left
Hudson, Six, 54	Sedan, 5	3,100	6	40.90	135	36x4 1/2	Left
Jeffery, 93	Limousine, 5	3,000	4	22.50	116	34x4	Left
Jeffery, 96	Sedan, 5	3,250	6	33.75	128	36x4 1/2	Left
Jeffery, 96	Limousine, 5	3,700	6	33.75	128	36x4 1/2	Left
Kisselcar, 48-6	Sedan	3,000	6	33.75	132	36x4 1/2	Left
Kisselcar, 48-6	Limousine, 7	4,100	6	33.75	132	36x4 1/2	Left
Kisselcar, 60-6	Roadster, 2	3,150	6	48.60	142	37x5 1/2	Left
Kisselcar, 60-6	Touring, 7	3,150	6	48.60	142	37x5 1/2	Left
Kisselcar, 60-6	Limousine, 7	4,000	6	48.60	142	37x5 1/2	Left
Klinekar, 6-50	Coupe	3,200	6	40.90	128	37x4 1/2	Left

\*Rear tires only; front tires are a size smaller

# Motor Cars Costing More Than \$3,000—Continued

NAME AND MODEL	Body Style and Seating Capacity	Price	No. of Cylinders	S. A. E. H. P.	Wheelbase Inches	Tire Size Inches	Location of Steering
Knox, 44.	Touring, 5 and 7.	\$3,500	4	40.00	Opt	36x4	Right
Knox, 44.	Torpedo, 4.	3,400	4	40.00	Opt	36x4	Right
Knox, 44.	Torpedo, 5.	3,450	4	40.00	Opt	36x4	Right
Knox, 44.	Raceabout, 2, 3&4	3,550	4	40.00	Opt	36x4	Right
Knox, 44.	Limousine, 7.	4,400	4	40.00	Opt	36x4	Right
Knox, 44.	Landulet, 7.	4,450	4	40.00	Opt	36x4	Right
Knox, 46.	Raceabout, 2, 3&4	4,500	6	45.95	134	38x5	Optional
Knox, 46.	Torpedo, 6 and 7.	4,500	6	45.95	134	38x5	Optional
Knox, 46.	Limousine, 7.	5,500	6	45.95	134	38x5	Optional
Knox, 46.	Landulet, 7.	5,550	6	45.95	134	38x5	Optional
Knox, 45.	Touring, 7.	3,800	4	40.00	126	37x5	Optional
Knox, 45.	Torpedo, 6 and 7.	3,700	4	40.00	126	37x5	Optional
Knox, 45.	Limousine, 7.	4,700	4	40.00	126	37x5	Optional
Knox, 45.	Landulet, 7.	4,750	4	40.00	126	37x5	Optional
Knox, 66.	Touring, 6 and 7.	5,000	6	60.00	134	38x5	Optional
Locomobile, 38RD.	Touring, 4 and 5.	4,400	6	43.80	128	36x5	Right
Locomobile, 38LD.	Touring, 4 and 5.	4,400	6	43.80	132	36x5	Left
Locomobile, 38LD.	Roadster, 2.	4,400	6	43.80	132	36x5	Left
Locomobile, 38LD.	Berline, Land., 7.	5,800	6	43.80	132	36x5	Left
Locomobile, 38LD.	Limousine, 7.	5,400	6	43.80	132	36x5	Left
Locomobile, 38LD.	Landulet, 7.	5,500	6	43.80	132	36x5	Left
Locomobile, 38LD.	Coupe, 3.	5,200	6	43.80	132	36x5	Left
Locomobile, 38LD.	Berline, Lim., 7.	5,700	6	43.80	132	36x5	Left
Locomobile, 48LD.	Roadster, 2.	5,100	6	48.60	140	37x5	Left
Locomobile, 48LD.	Touring, 6 and 7.	5,100	6	48.60	140	37x5	Left
Locomobile, 48LD.	Limousine, 7.	6,200	6	48.60	140	37x5	Left
Locomobile, 48LD.	Landulet, 7.	6,300	6	48.60	140	37x5	Left
Locomobile, 48LD.	Berline, Lim., 7.	6,500	6	48.60	140	37x5	Left
Locomobile, 48LD.	Berline, Land., 7.	6,600	6	48.60	140	37x5	Left
Locomobile, 48RD.	Touring, 4, 5 & 7.	5,100	6	48.60	136	37x5	Right
Lozier, 77.	Roadster, 2.	3,250	6	36.06	127	36x4	Left
Lozier, 77.	Touring, 5.	3,250	6	36.06	127	36x4	Left
Lozier, 77.	Limousine, 5 and 6	3,450	6	36.06	127	36x4	Left
Lozier, 77.	Coupe, 3.	3,850	6	36.06	127	36x4	Left
Lyons-Knight, K4.	Sedan, 5.	3,900	4	32.40	130	36x5	Left
Lyons-Knight, K4.	Berlin, 7.	4,300	4	32.40	130	36x5	Left
Marmon, 41.	Roadster, 2.	3,000	6	43.80	132	35x5	Left
Marmon, 41.	Touring, 4 and 5.	3,000	6	43.80	132	35x5	Left
Marmon, 41.	Limousine, 7.	3,000	6	43.80	132	35x5	Left
Marmon, 41.	Landulet, 7.	3,000	6	43.80	132	35x5	Left
Marmon, 32.	Touring, 4 and 5.	3,125	4	32.40	120	35x4	Left
Marmon, 32.	Limousine, 7.	4,000	4	32.40	120	35x4	Left
Marmon, 32.	Landulet, 3.	4,100	4	32.40	120	35x4	Left
Marmon, 48.	Roadster, 3.	5,000	6	48.60	145	37x5	Left
Marmon, 48.	Touring, 4, 5 & 7.	5,000	6	48.60	145	37x5	Left
Marmon, 48.	Landulet, 7.	6,350	6	48.60	145	37x5	Left
Marmon, 48.	Limousine, 7.	6,450	6	48.60	145	37x5	Left
Mercur, M-35.	Touring, 5.	3,000	4	32.40	124	35x4	Right
McFarlan, T.	Coupe, 4.	3,300	6	38.40	128	36x4	Left
McFarlan, T.	Limousine, 7.	4,000	6	38.40	128	36x4	Left
Mondex, Magic, 6-40.	Touring, 4 and 6.	4,500	6	27.40	134	36x4	Left
Mondex, Magic, 6-40.	Limousine, 6.	6,500	6	27.40	134	36x4	Left
Mondex, Magic, 6-60.	Touring, 6.	5,000	6	38.40	140	37x5	Left
Mondex, Magic, 6-60.	Limousine, 6.	6,000	6	38.40	140	37x5	Left
Morse, D.	Roadster, 2.	3,600	4	34.25	127	36x4	Right
Morse, D.	Touring, 4, 5 & 7.	3,600	4	34.25	127	36x4	Right
Moyer, G.	Touring, 7.	3,250	6	48.60	135	35x4	Right
National, 40.	Touring, 4 and 5.	3,300	4	38.00	132	36x4	Left
National, 40.	Roadster, 2.	3,150	4	38.00	132	36x4	Left
National, 40.	Touring, 7.	3,400	4	38.00	132	36x4	Left
National, 40.	Coupe, 3.	3,500	4	38.00	132	36x4	Left
National, 40.	Limousine, 7.	4,800	4	38.00	132	36x4	Left
Norwalk, D.	Limousine, 6.	4,000	6	36.06	131	37x4	Left
Norwalk, C.	Roadster, 2.	3,500	6	38.40	136	39x5	Left
Norwalk, C.	Touring, 4 and 6.	3,500	6	38.40	136	39x5	Left
Norwalk, C.	Limousine, 6.	5,000	6	38.40	136	39x5	Left
Oldsmobile, 54.	Limousine, 7.	4,300	6	43.80	132	36x5	Right
Oldsmobile, 54.	Touring, 7.	3,150	6	43.80	139	36x5	Right
Packard, 2-38.	Runabout, 2.	3,750	6	38.40	140	37x5	Left
Packard, 2-38.	Phaeton, 4 and 5.	3,750	6	38.40	140	37x5	Left
Packard, 2-38.	Touring, 6 and 7.	3,850	6	38.40	140	37x5	Left
Packard, 2-38.	Coupe, 3.	4,450	6	38.40	140	37x5	Left
Packard, 2-38.	Brougham, 4.	4,950	6	38.40	140	37x5	Left
Packard, 2-38.	Brougham, 6.	5,000	6	38.40	140	37x5	Left
Packard, 2-38.	Limousine, 6.	4,900	6	38.40	140	37x5	Left
Packard, 2-38.	Landulet, 6.	4,900	6	38.40	140	37x5	Left
Packard, 2-38.	Landulet, 7.	4,950	6	38.40	140	37x5	Left
Packard, 2-38.	Limousine, 7.	4,950	6	38.40	140	37x5	Left
Packard, 2-38.	Landulet, 7.	5,000	6	38.40	140	37x5	Left
Packard, 2-38.	Limousine, 6 and 7.	5,100	6	38.40	140	37x5	Left
Packard, 2-38.	Limousine, 7.	5,150	6	38.40	140	37x5	Left
Packard, 2-38.	Limousine, 7.	5,000	6	38.40	140	37x5	Left
Packard, 2-38.	Spec Six.	3,350	6	38.40	140	37x5	Left
Peerless, 38-Six.	Roadster, 3.	4,300	6	38.40	125	36x4	Optional
Peerless, 38-Six.	Touring, 4 and 5.	4,300	6	38.40	125	36x4	Optional
Peerless, 38-Six.	Coupe, 3.	5,000	6	38.40	125	36x4	Optional
Peerless, 38-Six.	Limousine, 7.	5,300	6	38.40	125	36x4	Optional
Peerless, 38-Six.	Landulet, 7.	5,400	6	38.40	125	36x4	Optional
Peerless, 38-Six.	Berline, 7.	5,500	6	38.40	125	36x4	Optional
Peerless, 48-Six.	Touring, 6 and 7.	5,000	6	48.60	137	37x5	Optional
Peerless, 48-Six.	Limousine, 7.	6,000	6	48.60	137	37x5	Optional
Peerless, 48-Six.	Landulet, 7.	6,100	6	48.60	137	37x5	Optional
Peerless, 48-Six.	Berline, 7.	7,200	6	60.00	140	38x5	Optional
Peerless, 60-Six.	Touring, 6 and 7.	6,000	6	60.00	140	38x5	Optional
Peerless, 60-Six.	Limousine, 7.	7,000	6	60.00	140	38x5	Optional
Peerless, 60-Six.	Landulet, 7.	7,100	6	60.00	140	38x5	Optional
Peerless, 60-Six.	Berline, 7.	7,200	6	60.00	140	38x5	Optional
Pierce-Arrow, 38C-2.	Runabout, 2.	4,300	6	38.40	Opt	36x4	Right
Pierce-Arrow, 38C-2.	Touring, 4 and 5.	4,300	6	38.40	Opt	36x4	Right
Pierce-Arrow, 38C-2.	Brougham, 7.	5,200	6	38.40	Opt	36x4	Right
Pierce-Arrow, 38C-2.	Landulet, 7.	5,200	6	38.40	Opt	36x4	Right
Pierce-Arrow, 38C-2.	Brougham, 7.	5,400	6	38.40	Opt	36x4	Right
Pierce-Arrow, 38C-2.	Landulet, 7.	5,400	6	38.40	Opt	36x4	Right
Pierce-Arrow, 48B-2.	Runabout, 2.	4,850	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Touring, 4 and 5.	4,850	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Touring, 7.	5,000	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Suburban, 7.	6,100	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Brougham, 5.	5,800	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Landulet, 5.	5,800	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Brougham, 5.	6,000	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Landulet, 5.	6,000	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Landau, 7.	6,100	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Suburban, 7.	6,300	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Landau, 7.	6,300	6	48.60	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Runabout, 2.	5,850	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Touring, 4 and 5.	5,850	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Touring, 7.	6,000	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Suburban, 7.	7,100	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Landau, 7.	7,100	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Suburban, 7.	7,300	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Landau, 7.	7,300	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Brougham, 5.	6,800	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Landulet, 5.	6,800	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Brougham, 5.	7,000	6	60.00	Opt	37x5	Right
Pierce-Arrow, 48B-2.	Landulet, 5.	7,000	6	60.00	Opt	37x5	Right
S. G. V., F.	Runabout, 3.	3,500	4	22.50	120	35x4	Left
S. G. V., F.	Touring, 4 and 5.	3,500	4	22.50	120	35x4	Left
S. G. V., F.	Limousine, 7.	4,250	4	22.50	120	35x4	Left
S. G. V., F.	Landulet, 7.	4,250	4	22.50	120	35x4	Left
S. G. V., F.	Brougham, 5.	4,500	4	22.50	120	35x4	Left
S. & M.-14-48.	Touring, 7.	3,750	6	33.75	130	34x4	Left
Simplex, 38.	Touring, 5.	5,600	4	38.00	137	35x5	Right
Simplex, 38.	Touring, 7.	5,700	4	38.00	137	35x5	Right
Simplex, 38.	Limousine, 6.	6,400	4	38.00	137	35x5	Right
Simplex, 38.	Limousine, 7.	6,500	4	38.00	137	35x5	Right
Simplex, 38.	Landulet, 6.	6,400	4	38.00	137	35x5	Right
Simplex, 38.	Landulet, 7.	6,500	4	38.00	137	35x5	Right
Simplex, D-I.	Touring, 5.	6,100	4	46.00	137	37x5	Right
Simplex, D-I.	Touring, 7.	6,200	4	46.00	137	37x5	Right
Simplex, D-I.	Specials.	4,600	4	46.00	129	37x5	Right
Spencer, 40.	Roadster, 2.	3,000	4	38.00	120	37x4	Right
Spencer, 40.	Touring, 5.	3,000	4	38.00	120	37x4	Right
Spencer, 40.	Touring, 7.	3,200	4	38.00	120	37x4	Right
Stearns-Knight, Four.	Roadster, 3.	3,750	4	28.90	121	36x4	Left
Stearns-Knight, Four.	Touring, 4 and 5.	3,750	4	28.90	121	36x4	Left
Stearns-Knight, Four.	Coupe, 4.	4,450	4	28.90	121	36x4	Left
Stearns-Knight, Four.	Touring, 6 and 7.	3,900	4	28.90	127	37x5	Left
Stearns-Knight, Four.	Sedan, 5.	5,000	4	28.90	127	37x5	Left
Stearns-Knight, Four.	Limousine, 7.	5,000	4	28.90	127	37x5	Left
Stearns-Knight, Four.	Landulet, 7.	5,100	4	28.90	127	37x5	Left
Stearns-Knight, Six.	Roadster, 3.	4,850	6	43.80	134	37x5	Left
Stearns-Knight, Six.	Touring, 4 and 5.	4,850	6	43.80	134	37x5	Left
Stearns-Knight, Six.	Coupe, 4.	5,550	6	43.80	134	37x5	Left
Stearns-Knight, Six.	Sedan, 5.	6,100	5	43.80	134	37x5	Left
Stearns-Knight, Six.	Touring, 6 and 7.	5,000	6	43.80	140	37x5	Left
Stearns-Knight, Six.	Limousine, 7.	6,100					



# The Program of the Show Week

List of Business and Social Occasions for the Week  
—Concerns Not Exhibiting—S. A. E. Program—  
Many Meetings of Business Organizations To Be Held

## Social Features

**T**HE Locomobile Co. of America will exhibit every car that will appear at the show at its showrooms up to the time of installation at Grand Central Palace. An additional twenty cars will also be displayed. This company will not plan any show entertainment, but is contemplating something new in the way of bringing the chauffeurs together, and that is a series of social evenings at its new home at Sixty-second street.

Moon Motor Car Co. will have its usual dinner at the Brown Chop House. The date for it has not been decided upon. The Manhattan Hotel has been selected as headquarters.

The Lozier Motor Co. will hold its customary dinner probably on the last night of the show.

One of the noteworthy show week social functions will be the Overland beef-steak party that President Willys will give in Reisenweber's ballroom on Wednesday, January 7, at 10.30 p. m. The Murray Hill Hotel will be the show headquarters.

The Garford company states that it will probably make the Murray Hill Hotel its headquarters.

It is expected that a large number of the automobile people from the Automobile Club of Worcester will motor down to the show.

The Moline Knight engine, which started its two-weeks test run at the Automobile Club of America on December 19, will end on January 2, or on the Monday of the show week.

Hotel Breslin will be the rendezvous for a large number of the automobile and accessory tradespeople, including the following firms: Buick, Marion, Pope-Hartford, Stevens-Duryea, U. S. Tire and the Beacon Sales.

Quite a few reservations have been made at the Hotel Belmont for the incoming factory men.

The tire people not exhibiting this year at the shows, such as the Diamond, Goodrich, Ajax-Grieb, Michelin, Fisk, Kelly-Springfield, Republic, Goodyear, Pennsylvania and others, will not hold any private exhibitions. No information as to their plans in the way of entertainment has been received as yet. Those concerns exhibiting are the Miller Rubber Co., Akron, O.; Braender Rubber & Tire Co., New York City; Thermoid Rubber Co., Trenton, N. J., and the Overman Tire Co., Cleveland, O.

The Colt-Stratton Co. will probably entertain the Cole agents as usual, but the details of the programme have not yet been framed.

## Concerns Not Exhibiting at Show

Ford Motor Co. will hold two private exhibitions of its cars, one at its salesroom at 1723 Broadway, this city, and one at its Long Island City plant.

Chevrolet Motor Co. will hold an exhibition of its cars at the salesroom, corner of Fifty-first street and Broadway.

## Society Automobile Engineers

**Sunday, January 4**—Annual Meeting A. C. A., Reception at the Manhattan Automobile Club.

**Monday, January 5**—Standards Committee Meeting S. A. E. Rooms, 9 a. m.

**Tuesday, January 6**—All-Day Session A. C. A., 9 a. m., including following: President's Address, Appointment of Tellers for Election of Officers, Treasurer's Report, Report on Election of Members, Report on Election of Officers, New Business.

11.30 a. m.—Nomenclature Division Report.

12 a. m.—Ball and Roller Bearings Division.

2 p. m.—Broaches Division Report.

2.45 p. m.—Electrical Equipment Division Report.

3.30 p. m.—W. H. Conant's paper on Storage Batteries.

4.15 p. m.—W. J. B. Thomas's paper on Necessity of More Special Data for Electric Car Designers.

4.30 p. m.—D. L. Gallop's paper on Automobile Effectiveness.

8 p. m.—Commercial Vehicle Session with following papers: 8.45 p. m., Final Drive for Motor Trucks, A. J. Slade; Internal Gear, V. V. Torbenson; Double Reduction Live Axle, B. B. Bachman; Worm Gear, John Younger; Chain, H. D. Church.

10 p. m.—Gasoline Locomotives for Mines, J. A. Anglada.

10.15 p. m.—Development of Electric Tractor for Handling Freight Cars Over Tracks Laid on City Streets, T. V. Buckwalter.

10.45 p. m.—Taxicab Specifications, L. P. Prossen.

**Wednesday, January 7**—No sessions scheduled.

**Thursday, January 8**—Miscellaneous Division Report, A. C. A., 9 a. m.

9.45 a. m.—Pleasure Car Wheels Division Report.

10.30 a. m.—J. W. Cain's paper on Radiators; C. G. Renold's paper on Workshop Organization; H. W. Allingham's paper on Scientific Shop Management.

1 p. m.—Motor Testing Division Report.

1.45 p. m.—Exhaust Discharge and Proper Manifold Design, F. C. Mock.

2.15 p. m.—Electrically controlled Dynamometer for Testing Gas Engines, R. C. Carpenter.

2.45 p. m.—Springs Division Report.

3.15 p. m.—Shifting Gears by Electricity, F. N. Nutt.

4 p. m.—Possibilities of the Cyclecar, W. B. Stout.

7.30 p. m.—Informal Reception at the Hotel Plaza.

8 p. m.—Banquet and Entertainment at the Hotel Plaza.

## Motor and Accessory Manufacturers

**Tuesday, January 6**—Executive Committee Meeting, Association's Offices, 10 a. m.

Board of Directors Meeting, Association's Offices, 10.30 a. m.

Banquet Committee Meeting, following Directors' Meeting.

Finance Committee Report, 2.30 p. m. Eleventh Annual Meeting, 3 p. m.

**Wednesday, January 7**—Sixth Annual Banquet, Waldorf-Astoria, 7.30 p. m.

**Thursday, January 8**—Board of Directors Meeting, 11 a. m., Association's Offices.

## Automobile Chamber of Commerce

**Wednesday, January 7**—Regular Monthly Meeting of the Directors, A. C. of C. Offices.

## Manhattan Automobile Club

**Tuesday, January 6**—Club Supper, 11 p. m.

**Thursday, January 8**—Club Meeting, Evening.

**Friday, January 9**—Club Meeting, Evening.

## American Automobile Association

**Tuesday, January 6**—Executive Board Meeting, Waldorf-Astoria, 10 a. m.

## Electric Vehicle Association

No meetings have as yet been scheduled for the show week. The annual banquet has been dropped this year.

## Importers' Automobile Association

A banquet is scheduled at the Astor, Saturday, January 3.

## Show Nights Schedule

**Friday, January 2**—Show Opened, Admission, \$1.

**Saturday, January 3**—No special attractions planned, Admission \$1.

**Monday, January 5**—No special attractions planned, Admission \$1.

**Tuesday, January 6**—Brooklyn Night, Admission, \$1.

**Wednesday, January 7**—Society Night, Admission, \$2.

**Thursday, January 8**—Army and Navy Night, Admission \$1.

**Friday, January 9**—No special attractions planned, Admission \$1.

**Saturday, January 10**—Closing Night, Admission \$1.

# Passenger Car Chassis Listed for 1914, In

ON this and the following seven pages are given detailed specifications of practically every model of passenger car manufactured for the 1914 season by American makers. From a study of these tables the automobilist, and everyone interested in motor car construction, can readily gain a comprehensive view of the various types of cars offered to the American public for the coming year.

Such a study will bring out the new departures in engineering practice, which have been doing so much of late to radically change the general layout of the chassis, the body, the disposition

of accessories, etc., in spite of the widely-believed idea that very little could now be done to improve such details. The new trends will be quickly apparent to the critic of the mechanical principles embodied in a chassis, the improvements in readjustment of parts, of more scientific regulation of the dimensions of shafts, of valves, etc. The more intelligent use of metals, new methods of casting and treating, the use of bearings more suited to their work and many other features are to be perceived.

Electric lighting and starting systems have been exciting the widest interest during the past year, practically all the manufac-

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION		IGNITION			CARBURETION			CRANKING SYSTEM	
					Shape	How Cast				System	Type of Pump	System	Make	Control	Make of Carburetor	Fuel Feed	Is Hot Air Pipe Fitted?	Type	Make
Abbott-Detroit, 34-40-K	4	4.125x5.250	27.25	280.6	L-Head	Block.	Left	Hel'l	Pump	Splash	Gear	Dual	Spl'd'r	Hand.	Zenith	Grav	Yes	Elec	Autolite
Abbott-Detroit, 44-50-L	4	4.500x5.250	32.40	349.9	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Gear	Dual	Spl'd'r	Hand.	Zenith	Grav	Yes	Elec	Autolite
Abbott-Detroit, Belle Isle	6	3.750x5.250	33.75	347.8	L-Head	Threes	Right	Hel'l	Pump	Splash	Gear	Sing.	Bosch	Hand.	Zenith	Pres	Yes	Elec	Autolite
Allen, 40	4	4.125x5.000	27.25	267.3	L-Head	Block.	Left	Gear	Thermo	Splash	Piston	Dual	Spl'd'r	Hand.	Rayfield	Grav	Yes	Elec	Autolite
American, 6-44**	6	4.250x5.500	43.35	468.0	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Piston		Eisemann	Hand.	Rayfield	Pres	No	Elec	Disco
American, 6-46**	6	4.250x5.500	43.80	468.0	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Piston		Eisemann	Hand.	Rayfield	Pres	No	Elec	Disco
Ames, 45	4	4.125x5.250	27.25	280.6	L-Head	Block.	Left	Hel'l	Pump	Spl-Pre	Piston	Dual	Remy	Hand.	Schebler	Grav		Elec	Gray & Davis
Apperson, 4-45	4	4.500x5.000	32.40	318.1	T-Head	Sep	Opp.	Hel'l	Pump	Pres	Gear	Dual	Nat'l.	Hand.	Rayfield	Grav	Yes	Elec	Undecided
Apperson, 4-45	4	4.500x5.000	32.40	318.1	T-Head	Sep	Opp.	Hel'l	Pump	Pres	Gear	Dual	Mea.	Hand.	Rayfield	Grav	Yes	Elec	Undecided
Apperson, 6-45	6	3.750x5.500	33.75	364.4	L-Head	Block.	Side	Hel'l	Pump	Splash	Gear	Sing.	Mea.	Hand.	Rayfield	Grav	Yes	Elec	Undecided
Apperson, 6-45	6	3.750x5.500	33.75	364.4	L-Head	Block.	Side	Hel'l	Pump	Splash	Gear	Sing.	Mea.	Hand.	Rayfield	Grav	Yes	Elec	Undecided
Apperson, 6-55	6	4.250x5.000	43.80	425.4	L-Head	Block.	Side	Hel'l	Pump	Pres	Gear	Sing.	Mea.	Hand.	Rayfield	Grav	Yes	Elec	Undecided
Apperson, 6-55	6	4.250x5.000	43.80	425.4	L-Head	Block.	Side	Hel'l	Pump	Pres	Gear	Sing.	Mea.	Hand.	Rayfield	Grav	Yes	Elec	Undecided
Arbentz	4	4.125x5.500	27.25	294.0	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pre	Gear	Dual		Hand.	Schebler	Grav	Yes	Elec	
Auburn, 4-40 & 4-41	4	4.500x5.000	32.40	318.1	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Gear	Dual	Remy	Hand.	Schebler	Pres	Yes	Elec	Remy
Auburn, 6-45	6	3.750x5.250	33.75	347.8	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Piston	Dual	Simms	Hand.	Rayfield	Grav	Yes	Elec	Remy
Auburn, 6-48	6	3.750x5.250	33.75	347.8	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Piston	Dual	Simms	Hand.	Rayfield	Grav	Yes	Elec	Remy
Austin, 55	6	4.000x5.500	38.40	414.7	T-Head	Threes	Opp.	Hel'l	Pump	Splash	Gear	Dual	Simms	Hand.		Grav	No	Elec	Remy
Austin, 77	6	4.500x7.000	48.60	667.9	T-Head	Sep	Opp.	Hel'l	Pump	Splash	Noncir.	Doub	Simms	Hand.		Grav	No	Air	Own
Buick, B24, B25	4	3.750x3.750	22.50	165.6	I-Head	Pairs.	Head	Hel'l	Pump	Splash	Gear	Dual	Delco	Hand.	Marvel	Grav	Yes	Elec	Delco
Buick, B36, B37, B38	4	3.750x5.000	22.50	220.9	I-Head	Pairs.	Head	Hel'l	Pump	Splash	Gear	Dual	Delco	Hand.	Marvel	Pres	Yes	Elec	Delco
Buick, B-55	6	3.750x5.000	33.75	331.4	I-Head	Pairs.	Head	Hel'l	Pump	Splash	Gear	Dual	Delco	Hand.	Marvel	Pres	Yes	Elec	Delco
Cadillac, 1914	4	4.500x5.750	32.40	365.8	L-Head	Sep	Right	Chain	Pump	Splash		Dual	Delco	H & A	Own	Pres	Yes	Elec	Delco
Cameron	4	3.625x5.000	20.25	206.4	I-Head	Block.	Head	Gear	Thermo	Splash	Piston	Dual		Hand.	Kingston	Grav	Yes	Elec	Diehl
Cartercar, 7	4	3.500x5.000	19.60	192.4	L-Head	Block.	Left	Hel'l	Pump	Splash	Piston	Dual	Delco	Hand.	Schebler	Pres	Yes	Elec	Delco
Cartercar, 5	4	4.125x4.750	27.25	253.9	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Piston	Dual	Briggs	Hand.	Schebler	Grav-P	Yes	Elec	Jesco
Case, 25	4	3.750x4.750	22.50	209.9	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Piston	Dup'x	Bosch	Hand.	Rayfield	Grav	Yes	Elec	Westing'ae
Case, 35	4	4.250x5.500	28.90	312.0	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Gear	Dual	Bosch	Hand.	Rayfield	Grav	Yes	Elec	Westing'ae
Case, 40	4	4.500x5.250	32.40	334.0	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Gear	2-Pt	Bosch	Hand.	Rayfield	Pres	No	Elec	Westing'ae
Chadwick, 19	6	5.000x6.000	60.00	721.0	L-Head	Pairs.	S & H	Hel'l	Pump	Pres	Piston	Doub	Bosch	Hand.	Own	Pres	Yes	Elec	Westing'ae
Chadwick, 19	6	5.000x6.000	60.00	721.0	L-Head	Pairs.	S & H	Hel'l	Pump	Pres	Piston	Doub	Bosch	Hand.	Own	Pres	Yes	Elec	Westing'ae
Chalmers, 24	6	4.000x5.500	38.40	414.7	T-Head	Threes	Opp.	Hel'l	Pump	Spl-Pre	Gear	Sing.	Bosch	Hand.	Rayfield	Pres	Yes	Elec	Chal. Ents.
Chandler, 14	6	3.375x5.000	27.40	268.4	L-Head	Block.	Right	Chain	Pump	Splash	Gear	Sing.	Bosch	Hand.	Stromberg	Pres	Yes	Elec	Westing'ae
Chevrolet, H-2	4	3.690x4.000	21.38	170.9	I-Head	Block.	Head	Hel'l	Thermo	Splash	Gear	Sing.	Simms	Hand.	Zenith	Grav	Yes	Elec	Autolite Ex.
Chevrolet, H-4	4	3.690x4.000	21.38	170.9	I-Head	Block.	Head	Hel'l	Thermo	Splash	Gear	Sing.	Simms	Hand.	Zenith	Pres	Yes	Elec	Autolite Ex.
Coey, A	4	5.500x5.250	48.40	498.9	T-Head	Pairs.	Opp.	Hel'l	Thermo	Spl-Pre	Gear	Dual	Bosch	Hand.	Schebler	Grav			
Colby, 6C	6	4.125x5.250	40.90	420.9	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Piston	Doub	Eisemann	Hand.	Rayfield	Pres	Yes	Elec	Gray & Davis
Cole, Four	4	4.250x5.250	28.90	297.8	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Piston	Dual	Delco	H & A	Stromberg	Pres	Yes	Elec	Delco
Cole, Six	6	4.250x5.250	43.80	446.7	L-Head	Pairs.	Left	Chain	Pump	Splash	Piston	Dual	Delco	H & A	Stromberg	Pres	Yes	Elec	Delco
Continental, 30	4	3.500x5.000	19.60	192.4	L-Head	Block.	Right	Hel'l	Thermo	Splash	Gear	Sing.	Gov.	Hand.	Schebler	Grav	Yes	Elec	Opt
Continental, 27	4	4.500x4.500	32.40	286.3	L-Head	Block.	Right	Hel'l	Pump	Splash	Cent	Dual	Remy	Hand.	Schebler	Grav	No	Elec	Jesco
Corbitt, D, E, F	4	4.000x4.500	25.60	236.2	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pre	Gear	Doub	At Kent	Hand.	Stromberg	Grav	Yes	Elec	Northeast
Correia, H	6	3.750x5.500	33.75	363.4	L-Head	Block.	Right	Hel'l	Pump	Splash	Piston	Sing.	Simms	Hand.	Zenith	Pres	Yes	Elec	Ward-L'd
Crane, 4	6	4.375x6.250	45.95	563.7	L-Head	Threes	Left	Chain	Pump	Pres	Gear	Dual	Bosch	Hand.	Newcomb	Pres	No	Elec	Rushmore
Croston, A, B, X	4	4.125x5.500	27.25	294.0	L-Head	Block.	Right	Hel'l	Thermo	Splash	Piston	Dual	Mea.	Hand.	Planhard	Grav			
Crow-Elkhart, D42, D45	4	4.000x5.000	25.60	251.3	L-Head	Pairs.	Left	Gear	Thermo	Splash	Piston	Dual	Briggs	Hand.	Schebler	Grav	Yes	Acet.	Prestolite
Crow-Elkhart, D52, 54, 55, 56	4	4.250x5.500	28.90	312.0	L-Head	Block.	Left	Gear	Thermo	Splash	Piston	Dual	Briggs	Hand.	Schebler	Grav	Yes	Elec	Emerson
Crow-Elkhart, D62, 64, 65, 66	6	3.750x5.500	33.75	364.4	L-Head	Block.	Left	Gear	Thermo	Splash	Piston	Dual	Briggs	Hand.	Schebler	Grav	Yes	Elec	Emerson

\*\*Has Underlaid Frame.

ABBREVIATIONS:—Cylinders: Sep., separate. Valve Location: Opp., opposite; Head, both valves in the head; S. & H., side and head. Cooling: Thermo, thermo-siphon. Lubrication: Spl-pres, splash pressure; Pres, pressure; Flyw'l, flywheel; Cent, centrifugal; Ecc, eccentric. Ignition: Sing, single; Dup'x, duplex, Doub., double; 2-Pt., two-point; Westing'ae, Westinghouse; Spl'd'r, Splittor; At Kent, At water Kent; Nat'l, National; Connec, Connecticut; Mich., Michigan; H. & A., hand and automatic; Auto, automatic. Fuel Feed: Grav, gravity; Pres, pressure; Grav. P., pressure and gravity. Cranking System: Elec., electric; Mech., mechanical; Acet., acetylene; Ex., extra.



# Including Horsepower and Mechanical Details

turers having either taken them up or considered them in laying out their plans for the 1914 cars. The very latest information on the provisions which the makers have made in this respect is incorporated in the tables.

Several companies have announced a radical departure for the new season in the adoption of electric or pneumatic gearshifting apparatus. Others have made changes in their carburetor equipment, in their lubricating systems, their magneto drive or in some other particulars which reveal at once to the alert mind the improvements in design and construction which have been

successfully introduced during the past year. This is the purpose of these tables, the preparation of which entailed months of work involving the greatest care to insure accuracy.

In order to make the term S. A. E. H. P. used in the tables intelligible to all, it might be well to explain that in calculating the horsepower of the motors used in the various cars, the formula of the Society of Automobile Engineers was followed. This equals the cylinder bore squared, multiplied by the number of cylinders and divided by the constant 2.5. Explanations of the abbreviations used are given at the bottom of each page.

Lighting System	TRANSMISSION								RUNNING GEAR				CONTROL		BEARINGS				MAKE AND MODEL	
	Clutch Type	GEARSET			Final Drive	Car Drives Through	Rear Axle	Total Gear Ratio on Direct	Wheel-base	TIRES		Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Crankshaft Type and No.	Gearset	Rear Axle		Front Wheel
		Type	Location	Forward Speeds						Front	Rear									
Autolite	Disk	Sel	Unit M	4	Bevel	Rad Rd	Float	3.50-1	116	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Roll	B&R	Roll	Abbott-Detroit, 34-40-K
Autolite	Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	121	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Roll	B&R	Roll	Abbott-Detroit, 44-50-L
Autolite	Disk	Sel	Unit M	4	Bevel	Rad Rd	Float	4.00-1	130	35x4	35x4	Wood	Ell	Left	Cent	Plain, 3	Roll	B&R	Roll	Abbott-Detroit, Belle Isle
Autolite	Disk	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	118	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Allen, 40
Disco	Cone	Sel	Amid	4	Bevel	Tor T	Float	3.60-1	132	38x4	38x4	Wood	Ell	Right	Right	Plain, 4	Ball	Ball	Ball	American, 6-44**
Disco	Cone	Sel	Amid	4	Bevel	Tor T	Float	3.60-1	140	38x4	38x4	Wood	Ell	Right	Right	Plain, 4	Ball	Ball	Ball	American, 6-48**
Gray & Davis	Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	118	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Ball	Ball	Ames, 45
Undecided	Con Bd	Sel	Unit M	3	Bevel	Springs	Float	3.53-1	116	34x4	34x4	Wood	Ell	Left	Cent	Plain, 5	Ball	Ball	Ball	Apperson, 4-45
Undecided	Con Bd	Sel	Unit M	3	Bevel	Springs	Float	3.53-1	120	36x4	36x4	Wood	Ell	Left	Cent	Plain, 5	Ball	Ball	Ball	Apperson, 4-45
Undecided	Con Bd	Sel	Unit M	3	Bevel	Springs	Float	3.53-1	128	36x4	36x4	Wood	Ell	Left	Cent	Plain, 5	Ball	Ball	Ball	Apperson, 6-45
Undecided	Con Bd	Sel	Unit M	3	Bevel	Springs	Float	3.53-1	120	36x4	36x4	Wood	Ell	Left	Cent	Plain, 5	Ball	Ball	Ball	Apperson, 6-45
Undecided	Con Bd	Sel	Unit M	3	Bevel	Springs	Float	3.53-1	120	37x4	37x4	Wood	Ell	Left	Cent	Plain, 7	Ball	Ball	Ball	Apperson, 6-55
Undecided	Con Bd	Sel	Unit M	3	Bevel	Springs	Float	3.53-1	128	37x4	37x4	Wood	Ell	Left	Cent	Plain, 7	Ball	Ball	Ball	Apperson, 6-55
	Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.75-1	120	36x4	36x4	Opt	Ell	Left	Cent	Plain, 3	Roll	Ball	Ball	Arbenz
Remy	Cone	Sel	Amid	3	Bevel	Tor R	Float	3.50-1	120	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Auburn, 4-40 & 4-41
Remy	Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	130	37x4	37x4	Wood	Ell	Right	Right	Plain, 4	Ball	Ball	Ball	Auburn, 6-45
Remy	Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	130	37x4	37x4	Wood	Ell	Left	Cent	Plain, 4	Ball	Ball	Ball	Auburn, 6-46
Remy	Disk	Sel	Unit M	3	Bevel	Springs	Float	4.00-1*	141	37x5	37x5	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Austin, 55
Remy	Disk	Sel	Amid	4	Bevel	Springs	Float	3.00-1*	141	37x5	37x5	Wood	Ell	Left	Cent	Plain, 7	Ball	Ball	Ball	Austin, 77
Delco	Cone	Sel	Amid	3	Bevel	Tor R	Float	4.00-1	105	32x3	32x3	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Ball	Buick, 824, 825
Delco	Cone	Sel	Unit M	3	Bevel	Tor R	Float	4.00-1	112	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Ball	Buick, B36, B37, B38
Delco	Cone	Sel	Unit M	3	Bevel	Tor R	Float	3.75-1	130	36x4	36x4	Wood	Ell	Left	Cent	Plain, 4	Ball	Ball	Ball	Buick, B-55
Delco	Cone	Sel	Amid	3	Bevel	Springs	Float	2.50-1*	120	36x4	36x4	Wood	Plat	Right	Right	Plain, 5	Ball	Roll	Roll	Cadillac, 1914
Diehl	Cone	Sel	Unit X	4	Bevel	Tor T	Float	3.00-1	115	32x3	32x3	Opt	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Cameron
Delco		Fric	Amid		Chain	Rad Rd	Float	3.45-1	106	32x3	32x3	Wood	Ell	Right	Right	Plain, 3	Ball	Roll	Ball	Cartecar, 7
Jesco		Fric	Amid		Chain	Rad Rd	Float	3.60-1	116	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Cartecar, 5
Westing's	Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.75-1	110	32x4	32x4	Wood	Plat	Left	Cent	Plain, 3	Roll	B&R	Ball	Case, 25
Westing's	Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	120	35x4	35x4	Wood	Ell	Left	Cent	Plain, 3	Roll	B&R	Ball	Case, 35
Westing's	Disk	Sel	Amid	3	Bevel	Springs	Float	3.67-1	124	37x4	37x4	Wood	Ell	Right	Right	Plain, 3	Roll	Roll	Roll	Case, 40
Westing's	Exp Bd	Sel	Amid	4	Chain	Rad Rd	Dead	2.25-1	112	36x4	36x4	Wood	Plat	Right	Right	Plain, 4	Ball	Ball	Ball	Chadwick, 19
Westing's	Exp Bd	Sel	Amid	4	Chain	Rad Rd	Dead	2.25-1	133	37x5	37x5	Wood	Plat	Right	Right	Plain, 4	Ball	Ball	Ball	Chadwick, 19
Chal-Ents	Disk	Sel	Unit M	4	Bevel	Tor R	Float	3.75-1	132	36x4	36x4	Opt	Ell	Left	Cent	Plain, 3	Roll	Roll	Roll	Chalmers, 24
Battery	Disk	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	120	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Chandler, 14
Autolite Ex	Cone	Sel	Amid	3	Bevel	Springs	Semi F	3.70-1	104	30x3	30x3	Wood	Ell	Left	Cent	Plain, 3	Ball	B&R	Ball	Chevrolet, H-2
Autolite Ex	Cone	Sel	Amid	3	Bevel	Springs	Semi F	4.00-1	104	32x3	32x3	Wood	Ell	Left	Cent	Plain, 3	Ball	B&R	Ball	Chevrolet, H-2
	Disk	Sel	Unit X	3	Bevel	Springs	Semi F	3.00-1	128	34x4	34x4	Wood	Ell	Right	Cent	Plain, 3	Plain	Roll	Ball	Coey, A
Gray & Davis	Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.66-1	136	37x5	37x5	Wood	Ell	Right	Right	Roll, 8	Roll	Roll	Roll	Colby, 6C
Delco	Cone	Sel	Unit M	3	Bevel	Springs	Float	4.23-1	120	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Cois, Four
Delco	Cone	Sel	Unit M	3	Bevel	Springs	Float	3.93-1	136	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Cois, Six
Opt	Disk	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	110	32x3	32x3	Wood	Ell	Left	Cent	Plain, 3	Roll	Roll	Roll	Continental, 30
Jesco	Cone	Sel	Unit X	3	Bevel	Rad Rd	Opt	3.50-1	118	34x4	34x4	Wood	Ell	Right	Cent	Plain, 3	Ball	Ball	Ball	Continental, 27
Northeast	Disk	Sel	Unit M	3	Bevel	Springs	Float	3.78-1	120	34x4	34x4	Wood	Ell	Right	Cent	Plain, 3	Ball	Ball	Ball	Corbitt, D, E, F
Ward-L'd	Cone	Sel	Unit X	3	Bevel	Tor T	Float	4.00-1	128	34x4	34x4	Wood	Ell	Left	Cent	Plain, 4	Ball	Ball	Ball	Correja, H
Rushmore	Disk	Sel	Unit M	4	Bevel	Springs	Float	3.00-1	136	36x4	37x5	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Crane, 4
Northeast	Disk	Sel	Amid	3	Bevel	Tor T	Float	3.50-1	121	36x4	36x4	Opt	Ell	Left	Cent	Plain, 3	Plain	Ball	Roll	Croton, A, B, X
Briggs	Disk	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00-1	114	33x4	33x4	Wood	Ell	Right	Cent	Plain, 3	Roll	Roll	Ball	Crow-Elkhart, D42, D45
Briggs	Disk	Sel	Unit X	3	Bevel	Rad Rd	Float	4.00-1	120	34x4	34x4	Wood	Ell	Right	Cent	Plain, 3	Roll	Roll	Ball	Crow-Elkhart, D52, 54, 55, 56
Briggs	Disk	Sel	Unit X	3	Bevel	Rad Rd	Float	4.00-1	130	36x4	36x4	Wood	Ell	Right	Cent	Plain, 4	Roll	Roll	Ball	Crow-Elkhart, D62, 64, 65, 66

**ABBREVIATIONS:**—Clutch Type: Exp. Bd., expanding band; Con. Bd., contracting band. Gearset: Sel., selective; Prog., progressive; Plan., planetary; Fric., friction; Unit M, unit with the motor; Unit X, unit with the rear axle; Amid., amidships. Drive: Bevel, shaft with bevel gears in rear axle; Worm, shaft with worm gears in rear axle; Worm B, shaft with worm bevel gears in rear axle. Car Drives Through: Tor. T., torsion tube; Tor. R., torsion rod; Rad. Rd., radius rods; TTRR, torsion tube and radius rods. Rear Axle: Float, floating; Semi F., semi-floating;  $\frac{1}{2}$  Float, three-quarter floating. Gear Ratio: \* two speed rear axle. Wheels: Opt., optional. Springs: Ell., elliptic;  $\frac{1}{2}$  Ell., semi-elliptic;  $\frac{3}{4}$  Ell., three-quarter elliptic; Plat., platform. Gearshift: Elec., electrically operated; Bearings: Roll., roller; B. & R., ball and roller; B. & P., ball and plain; B. R. & P., ball, roller and plain.

# Passenger Car Chassis Listed for 1914, In

MAKE AND MODEL	No. of Cylinders	Bore and Strokes, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION		IGNITION			CARBURETION			CRANKING SYSTEM	
					Shape	How Cast				System	Type of Pump	System	Make	Control	Make of Carburetor	Fuel Feed	Is Hot Air Pipe Fitted?	Type	Make
Cunningham, M.	4	4.750x5.750	36.10	407.6	I-Head	Pairs.	Head	Hel'l	Pump	Spl-Pre	Gear	Dual	Bosch	Hand.	Rayfield	Pres	Yes	Elec	Northeast
Davis 35 J&K	4	3.500x5.000	19.60	192.4	L-Head	Block.	Right.	Hel'l	Thermo.	Splash		Sing.	Westing'ae	Hand.	Stromberg	Grav	Yes	Elec	Westing'ae
Davis, 50A	4	4.500x5.500	32.40	349.9	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Gear	Doub.	Mea	Hand.	Stromberg	Grav	Yes	Elec	Gray & Davis
Davis, 6-50	6	3.750x5.250	33.75	347.8	L-Head	Threes	Right.	Hel'l	Pump	Spl-Pre	Gear		Mea	Hand.	Stromberg	Pres	Yes	Elec	Gray & Davis
Day Utility, D	4	4.000x4.500	25.60	226.2	L-Head	Pairs.	Left	Gear.	Pump	Splash		Doub.	Remy	Hand.	Schebler	Grav	No		
Detroit, A	4	3.500x5.000	19.60	192.4	L-Head	Block.	Right	Hel'l	Thermo.	Splash		Dual	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Remy Ex.
DeSoto, Six	6	4.000x5.000	38.40	376.9	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pre	Gear	Dual	Remy	Hand.	Schebler	Pres	No	Air	Own
Dispatch, 1914	4	3.750x5.000	22.50	220.9	L-Head	Block.	Left	Hel'l	Thermo.	Pres	Gear	Dual	Spl'd'rf	Hand.	Zenith	Grav	No	Elec	U. S. L. Ex.
Dorris, I	4	4.375x5.000	30.63	300.7	I-Head	Pairs.	Head	Hel'l	Pump	Splash		Sing.	Bosch	Hand.	Fletcher	Pres	No	Elec	Westing'ae
Duryea	2	3.750x3.750		82.8	2-Cycle	Sep			Air	In fuel.		Sing.	Batt.	Hand.	Heitger	Grav	No	Mech	Own
Empire, 31	4	3.750x4.500	22.50	198.8	L-Head	Pairs.	Left	Spur	Thermo.	Spl-Pre	Piston	Sing.	Eisemann	Fixed.	Holley	Grav	Yes		
Enger, A, B, C, & G	4	4.500x5.250	32.40	334.0	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Cent.	Dual	Remy	Hand.	Schebler	Grav	No	Elec	Northeast Ex
Fal, Grayhound.	4	4.250x5.500	23.90	312.0	L-Head	Block.	Right.	Hel'l	Pump	Splash		Dual	Westing'ae	Hand.	Schebler	Grav	Yes	Air	Thurber
Fal	4	4.250x5.500	28.90	312.0	L-Head	Block.	Right.	Worm	Pump	Spl-Pre		Sing.	Westing'ae	Hand.	Schebler	Grav	No		
Fiat, 54	4	4.375x6.000	30.00	353.3	L-Head	Block.	Right.	Hel'l	Pump	Pres	Gear	Dual	Bosch	Hand.	Own	Pres	No	Elec	Westing'aeEx
Fiat, 55	4	5.125x6.750	42.60	557.0	L-Head	Block.	Right.	Hel'l	Pump	Pres	Gear	Dual	Bosch	Hand.	Own	Pres	No	Elec	Westing'aeEx
Fiat, 58	6	4.375x6.000	45.00	529.9	L-Head	Block.	Right.	Hel'l	Pump	Pres	Gear	Dual	Bosch	Hand.	Own	Pres	No	Elec	Westing'aeEx
Firestone, Col., 86-E	4	4.125x5.250	27.25	280.6	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pre	Piston	Dual	Spl'd'rf	Hand.	Schebler	Grav	No	Elec	Gray & Davis
Firestone, Col., 69D	4	4.500x5.000	32.40	318.1	L-Head	Pairs.	Right.	Hel'l	Pump	Spl-Pre	Piston	Doub.	Mea	Hand.	Schebler	Grav	No	Elec	
Firestone, Col., 60E	4	4.500x5.500	32.40	349.9	L-Head	Pairs.	Right.	Hel'l	Pump	Spl-Pre	Piston	Doub.	Connect	Hand.	Schebler	Grav	No	Elec	Gray & Davis
Firestone, Col., 90E	6	4.125x5.250	40.90	420.9	L-Head	Threes	Right.	Hel'l	Pump	Spl-Pre	Pistou	Doub.	Connect	Hand.	Rayfield	Grav	Yes	Elec	Gray & Davis
Flyer, A	4	2.750x4.500	12.10	107.0	L-Head	Block.	Left	Hel'l	Thermo.	Splash		Sing.		Fixed.	Optional	Grav	No	Elec	Ward-L'd
Ford, T	4	3.750x4.000	22.50	176.7	L-Head	Block.	Right.	Spur	Thermo.	Splash		Sing.	Own	Hand.	Optional	Grav	Yes		
Franklin, 6-30	6	3.625x4.000	31.60	247.7	I-Head	Sep	Head	Hel'l	Air	Splash	Gear	Sing.	Eisemann	Gov	Own	Grav-P	No	Elec	Frank-Ents
Gleason, R	2	4.750x4.000	18.00	141.7	L-Head	Sep	Side	Gear	Thermo.	Spl-Pre		Dual	Remy	Hand.	Schebler	Grav	No		
Glide, 38-42	4	4.125x5.250	27.25	280.6	L-Head	Block.	Left	Hel'l	Pump	Splash	Piston	Dual	Westing'ae	H & A.	Schebler	Grav	No	Elec	Westing'ae
Grant, 21	4	2.750x4.000	12.10	95.0	L-Head	Block.	Right	Hel'l	Thermo.	Splash	Noncir.	Sing.		Hand.	Mayer	Grav	Yes	Elec	Extra
Great Southern, 50	4	5.190x6.000	43.05	507.2	L-Head	Pairs.	Right	Gear	Pump	Spl-Pre	Gear	Dual	Bosch	Hand.	Stromberg	Grav	No	Opt	Opt., Ex
Great Western, 1914	4	4.250x5.500	28.90	312.0	L-Head	Sep	Right	Hel'l	Pump	Splash	Piston	Dual	Kingston	Hand.	Kingston	Grav	Yes	Elec	Gray & Davis
Great Eagle, B	4	4.750x5.500	36.10	389.9	T-Head	Pairs.	Opp	Gear	Pump	Pres	Gear	Doub.	Eisemann	Hand.	Rayfield	Grav	Yes	Elec	Autolite
Havers, Six 44	6	3.750x5.000	33.75	331.4	L-Head	Pairs.	Right	Hel'l	Thermo.	Spl-Pre	Gear	Dual	Eisemann	Hand.	Stromberg	Pres	Yes	Elec	Gray & Davis
Havers, Six 60	6	4.125x5.250	40.90	420.9	L-Head	Pairs.	Right	Hel'l	Pump	Spl-Pre	Piston	Dual	Eisemann	Hand.	Stromberg	Opt	Yes	Elec	Gray & Davis
Haynes, 28	4	4.250x5.500	28.90	312.0	L-Head	Pairs.	Right	Hel'l	Pump	Splash	Piston	Dual	Simms	Hand.	Stromberg	Pres	Yes	Elec	Leece-Neve
Haynes, 26	6	4.250x5.500	43.80	468.0	L-Head	Pairs.	Right	Hel'l	Pump	Splash	Piston	Dual	Simms	Hand.	Stromberg	Pres	Yes	Elec	Leece-Neve
Haynes, 27	6	4.250x5.500	43.80	468.0	L-Head	Pairs.	Right	Hel'l	Pump	Splash	Piston	Dual	Simms	Hand.	Stromberg	Pres	Yes	Elec	Leece-Neve
Henderson, DeLuxe	4	4.125x5.500	27.25	294.0	L-Head	Block.	Right	Hel'l	Thermo.	Splash	Piston	Dual	Eisemann	Hand.	Optional	Grav	Yes	Elec	Ward-L'd
Henderson, Six	6	3.750x5.500	33.75	364.4	L-Head	Block.	Right	Hel'l	Pump	Splash	Piston	Dual	Eisemann	Hand.	Carter	Grav	Yes	Elec	Ward-L'd
Herrshoff, 4-30	4	3.375x4.500	18.25	161.0	L-Head	Block.	Left	Spur	Thermo.	Splash	Piston	Dual	Westing'ae	Auto	Stromberg	Grav	Yes	Elec	Westing'ae
Herrshoff, 6-40	6	3.375x4.500	27.25	241.5	T-Head	Block.	Opp		Thermo.	Splash	Piston	Dual	Westing'ae	Auto	Stromberg	Grav	Yes	Elec	Westing'ae
Holly, A1	6	4.000x5.000	38.40	376.9	T-Head	Threes	Opp	Hel'l	Pump	Splash	Gear	2-Pt.	Remy	Hand.	Stromberg	Grav	Yes	Opt	Opt
Howard, D.	6	4.125x5.250	40.90	420.9	L-Head	Threes	Right	Hel'l	Pump	Spl-Pre	Piston	Doub.	Bosch	Hand.	Stromberg	Pres	Yes	Elec	Jesco
Hudson, 6-40	6	3.500x5.000	29.40	288.6	L-Head	Threes	Right	Hel'l	Pump	Spl-Pre	Piston	Dual	Delco	Hand.	Zenith	Grav	Yes	Elec	Delco
Hudson, 6-54	6	4.125x5.250	40.90	420.9	L-Head	Threes	Left	Hel'l	Pump	Spl-Pre	Piston	Dual	Delco	Hand.	Zenith	Grav	Yes	Elec	Delco
Hupmobile, 32	4	3.250x5.500	16.90	182.5	L-Head	Block.	Left	Chain.	Thermo.	Spl-Pre	Flyw'l	Sing.	Bosch	Hand.	Zenith	Grav	Yes	Elec	Westing'aeEx
Hupmobile, 32	4	3.250x5.500	16.90	182.5	L-Head	Block.	Left	Chain.	Thermo.	Spl-Pre	Flyw'l	Sing.	Bosch	Hand.	Zenith	Grav	Yes	Elec	Westing'aeEx
Illinois, K-14	4	4.250x4.750	28.90	269.4	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Gear	Dual	Remy	Hand.	Schebler	Pres	No	Air	Kellogg
Imperial, 32	4	4.250x5.250	28.90	297.8	L-Head	Block.	Left	Hel'l	Pump	Spl-Pre	Piston	Dual	Remy	Hand.	Stromberg	Grav	Yes	Elec	Northeast
Imperial, 34	4	4.500x5.000	32.40	318.1	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Piston	Dual	Remy	Hand.	Stromberg	Grav	Yes	Elec	Northeast
Imperial, 44-6	6	3.750x5.250	33.75	347.8	L-Head	Threes	Right	Hel'l	Pump	Splash	Piston	Dual	Remy	Hand.	Stromberg	Grav	Yes	Elec	Northeast
Imperial, 54-6	6	4.125x5.250	40.90	420.9	L-Head	Threes	Right	Hel'l	Pump	Splash	Piston	Dual	Remy	Hand.	Stromberg	Pres	Yes	Elec	Northeast
Inter-State, 45	6	4.000x5.000	38.40	376.9	L-Head	Block.	Left	Hel'l	Pump	Spl-Pre	Gear	Doub.	Mea	Hand.	Optional	Pres	No	Elec	Apico
Jackson, Olympic	4	4.125x4.750	27.25	253.9	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pre	Piston	Dual	Remy	Hand.	Schebler	Grav	Yes	Elec	Autolite
Jackson, Majestic	4	4.500x5.250	32.40	334.0	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pre	Piston	Dual	Remy	Hand.	Schebler	Grav	Yes	Elec	Autolite
Jackson, Sultanic	6	4.125x4.750	40.90	380.8	L-Head	Pairs.	Left	Chain.	Pump	Spl-Pre	Piston	Dual	Remy	Hand.	Schebler	Grav	Yes	Elec	Autolite
Jeffery, 93	4	3.750x5.250	22.50	231.9	L-Head	Block.	Left	Hel'l	Pump	Spl-Pre	Piston	Dup'x	Bosch	Hand.		Pres	Yes	Elec	U. S. L.
Jeffery, 96	6	3.750x5.250	33.75	347.0	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pre	Piston	Dup'x	Bosch	Hand.	Rayfield	Pres	Yes	Elec	U. S. L.
King, B	4	3.875x5.000	24.00	235.8	L-Head	Block.	Left	Hel'l	Thermo.	Spl-Pre	Gear	Dual	Briggs	Hand.	Stromberg	Grav	Yes	Elec	Ward-L'd
Kisselkar, 40	4	4.500x5.250	32.40	334.0	L-Head	Pairs.	Left	Chain.	Pump	Splash	Gear	Dup'x	Bosch	Hand.	Stromberg	Pres	Yes	Elec	Kissel-Eater
Kisselkar, 46	6	3.750x5.500	33.75	364.4	L-Head	Block.	Left	Hel'l	Pump	Pres	Gear	Sing.	Bosch	Hand.	Rayfield	Pres	Yes	Elec	Kissel-Eater
Kisselkar, 60	6	4.500x5.250	48.60	501.0	L-Head	Pairs.	Left	Chain.	Pump	Splash	Gear	Dual	Bosch	Hand.	Rayfield	Pres	Yes	Elec	Kissel-Eater

\*\*Has Underslung Frame.

ABBREVIATIONS: Cylinders: Sep., separate. Valve Location: Opp., opposite; Head, both valves in the head; S & H., side and head. Cooling: Thermo, thermo-siphon. Lubrication: Spl-pres, splash pressure; Pres, pressure; Flyw'l, flywheel; Cent, centrifugal; Ecc, eccentric. Ignition: Sing, single; Dup'x, duplex; Doub, double; 2-Pt., two-point; Westing'ae, Westinghouse; Spl'd'rf, Splitdorf; At Kent, Atwater Kent; Nat'l, National; Connect, Connecticut; Mich., Michigan; H. & A., hand and automatic; Auto, automatic. Fuel Feed: Grav., gravity; Pres, pressure; Grav. P., pressure and gravity. Cranking System: Elec., electric; Mech., mechanical; Acet., acetylene; Ex., extra.



## cluding Horsepower and Mechanical Details

Lighting System	TRANSMISSION								RUNNING GEAR					CONTROL		BEARINGS				MAKE AND MODEL
	Clutch Type	GEARSET			Final Drive	Car Drives Through	Rear Axle	Total Gear Ratio on Direct	Wheel-base	TIRES		Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	
		Type	Location	Forward Speeds						Front	Rear									
Northeast	Cone	Sel	Unit M.	3	Bevel	Springs	Float	3.43-1	124	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Cunningham, M
Westing'ae	Disk	Sel	Unit M.	3	Bevel	Springs	Float	4.00-1	112	33x4	33x4	Wood	Plat	Left	Cent	Plain, 3	B&R	Roll	Ball	Davis, 35 J&K
Gray & Davis	Cone	Sel	Unit M.	3	Bevel	Rad Rd.	Float	3.50-1	118	37x4	37x4	Wood	Plat	Right	Cent	Plain, 3	Ball	Ball	Ball	Davis, 50A
Gray & Davis	Disk	Sel	Unit M.	4	Bevel	Rad Rd.	Float	3.75-1	128	37x4	37x4	Wood	Plat	Left	Cent	Plain,	Ball	Ball	Ball	Davis, 6-50
	Disk	Sel	Unit M.	3	Bevel	Springs	Float	4.00-1	116	34x4	34x4	Wood	Ell	Right	Cent	Ball, 3	Ball	Ball	Ball	Day Utility, D
Remy Ex.	Disk	Sel	Unit M.	3	Bevel	Tor R	Float	4.00-1	104	32x3	32x3	Wood	Plat	Left	Cent	Ball, 3	Ball		Ball	Detroit, A
	Disk	Sel	Unit M.	3	Bevel	Tor T	Float	3.50-1	132	36x4	36x4	Wood	Ell	Opt	Cent	Plain, 4	Ball	Ball	Ball	DeSoto, Six
U. S. L. Ex	Disk	Fric	Amid	5	Chain	Rad Rd.	Dead	4.00-1	120	36x3	36x3	Wood	Ell	Right	Cent	Plain, 3	Ball	Ball	Ball	Dispatch, 1914
Westing'ae	Disk	Sel	Unit M.	3	Bevel	Tor R	Float	3.66-1	121	36x4	36x4	Wood	Plat	Left	Cent	Plain, 3	Roll	Roll	Roll	Dorris, I
				2	Roller		Dead	8.00-1	86 & 96	38x1	44x1	Wood	Ell	Cent	Pedal	Plain, 4	Roll	Ball	Ball	Duryea
	Disk	Sel	Unit M.	3	Bevel	Springs	Float	4.00-1	109	32x3	32x3	Wood	Ell	Right	Cent	Plain, 3	Ball	Roll	Ball	Empire, 31
Northeast Ex	Disk	Sel	Unit M.	3	Bevel	Springs	Float	3.50-1	120	34x4	34x4	Wood	Ell	Right	Cent	Plain, 3	Ball	Ball	Ball	Enger, A, B, C & G
Westing'ae	Disk	Sel	Amid	3	Bevel	Springs	Float	3.00-1	114	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Fal, Grayhound
Westing'ae	Disk	Sel	Amid	3	Bevel	Tor T	Float	3.50-1	116	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Fal
West'ae Ex.	Disk	Sel	Amid	4	Bevel	Tor T	Semi F	3.28-1	123	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Fiat, 54
West'ae Ex.	Disk	Sel	Amid	4	Bevel	Tor T	Semi F	2.70-1	128	36x4	37x5	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Fiat, 55
West'ae Ex.	Disk	Sel	Amid	4	Bevel	Tor T	Semi F	3.06-1	135	36x4	37x5	Wood	Ell	Right	Right	Plain, 4	Ball	Ball	Ball	Fiat, 56
Gray & Davis	Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	130	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Firestone, Col., 86-E
Gray & Davis	Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	122	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Firestone, Col., 69D
Gray & Davis	Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	122	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Firestone, Col., 60E
Gray & Davis	Disk	Sel	Unit M.	3	Bevel	Springs	Float	3.50-1	120	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Ball	Ball	Firestone, Col., 90E
Ward-L'd	Disk	Sel	Unit M.	2	Bevel	Springs	Float	4.00-1	100	28x3	28x3	Wire	Ell	Left	Cent	Plain, 3	Roll	Roll	Ball	Flyer, A
	Plan	Unit M.		2	Bevel	Tor T	Semi F	3.64-1	100	30x3	30x3	Wood	Cross	Left	Pedal	Plain, 3	Plain	Roll	Ball	Ford, T
Frank'n-Entz	Disk	Sel	Amid	3	Bevel	Springs	Semi-F	3.71-1	120	34x4	34x4	Wood	Ell	Left	Cent	Plain, 7	Ball	Roll	Roll	Franklin, 6-30
	Disk	Sel	Amid	3	Bevel	Tor R	Float	6.00-1	96	36x2	36x2	Wood	Ell	Right	Right	Plain, 2	Plain	Roll	Ball	Gleason, R
Westing'ae	Disk	Sel	Unit M.	3	Bevel	Springs	Float	3.50-1	118	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Ball	Ball	Glide, 38-42
Extra	Cone	Prog	Unit X.	2	Bevel	Tor T	Float	4.50-1	90	28x3	28x3	Wire	Cross	Left	Cent	Plain, 2	BR&P	Roll	Ball	Grant, 21
Opt., Ex	Cone	Sel	Amid	3	Bevel	Springs	Semi F	2.60-1	128	36x4	36x4	Wood	Ell	Right	Cent	Plain, 3	Roll	Roll	Roll	Great Southern, 50
Gray & Davis	Cone	Sel	Unit M.	3	Bevel	Tor T	Float	3.50-1	118	36x4	36x4	Wood	Ell	Right	Right	Plain, 5	Ball	B&R	Ball	Great Western, 1914
Autolite	Cone	Sel	Amid	3	Bevel	Rad R.	Float	3.39-1	135	37x5	37x5	Wood	Plat	Left	Cent	Plain, 3	Roll	Roll	Roll	Great Eagle, B
Gray & Davis	Disk	Sel	Unit M.	3	Bevel	Rad Rd.	Float	3.75-1	122	36x4	36x4	Wood	Plat	Right	Right	Plain, 3	Ball	B&R	Ball	Havers, Six 44
Gray & Davis	Disk	Sel	Unit M.	3	Bevel	Rad Rd.	Float	3.75-1	128	36x4	36x4	Wood	Plat	Right	Right	Plain, 3	Ball	B&R	Ball	Havers, Six 60
Leece-New	Con Bd	Sel	Unit M.	3	Bevel	Tor R	Float	3.55-1	118	34x4	34x4	Wood	Ell	Left	Elec	Plain, 3	Roll	Ball	Roll	Haynes, 28
Leece-New	Con Bd	Sel	Unit M.	3	Bevel	Tor R	Float	3.66-1	130	36x4	36x4	Wood	Ell	Left	Elec	Plain, 4	Roll	Roll	Roll	Haynes, 26
Leece-New	Con Bd	Sel	Unit M.	3	Bevel	Tor R	Float	3.66-1	136	36x4	36x4	Wood	Ell	Left	Elec	Plain, 4	Roll	Roll	Roll	Haynes, 27
Ward-L'd	Cone	Sel	Unit X.	3	Bevel	Tor T	Float	3.65-1	116	35x4	35x4	Opt	Ell	Left	Cent	Plain, 3	Ball	Roll	Ball	Henderson, DeLuxe
Ward-L'd	Cone	Sel	Unit X.	3	Bevel	Tor T	Float	3.50-1	126	35x4	35x4	Opt	Ell	Left	Cent	Plain, 5	Ball	Ball	Ball	Henderson, Six
Westing'ae	Disk	Sel	Unit M.	4	Bevel	Tor T	Semi F	4.00-1	110	32x3	32x3	Wood	Ell	Left	Cent	Plain, 2	P&B	Roll	Ball	Herreshoff, 4-30
Westing'ae	Disk	Sel	Unit M.	4	Bevel	Tor T	Semi F	4.00-1	124	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	P&B	Roll	Ball	Herreshoff, 6-40
Ward-L'd	Cone	Sel	Unit X.	3	Bevel	Tor T	Float	3.25-1	130	35x4	35x4	Wood	Ell	Left	Cent	Plain, 3	Plain	Ball	Ball	Holly, A1
Jesco	Cone	Sel	Unit M.	3	Bevel	Springs	Float	3.44-1	130	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Howard, D
Delco	Disk	Sel	Unit M.	3	Bevel	Springs	Float	4.00-1	123	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Roll	Roll	Hudson, 6-40
Delco	Disk	Sel	Unit M.	4	Bevel	Tor R	Float	3.75-1	135	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	P&R	Roll	Roll	Hudson, 6-54
West'ae Ex.	Disk	Sel	Unit M.	3	Bevel	Tor T	Float	3.86-1	106	33x4	33x4	Wood	Cross	Right	Cent	Plain, 3	B&R	Roll	Roll	Hupmobile, 32
West'ae Ex.	Disk	Sel	Unit M.	3	Bevel	Tor T	Float	3.86-1	126	33x4	33x4	Wood	Cross	Right	Cent	Plain, 3	B&R	Roll	Roll	Hupmobile, 32
	Disk	Sel	Amid	3	Bevel	Rad Rd.	Float	4.00-1	120	37x4	37x4	Wood	Ell	Right	Cent	Plain, 3	Ball	Ball	Ball	Illinois, K-14
Northeast	Disk	Sel	Unit M.	3	Bevel	Rad Rd.	Float	3.50-1	114	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	B&R	Ball	Imperial, 32
Northeast	Disk	Sel	Unit M.	3	Bevel	Rad Rd.	Float	3.50-1	118	34x4	34x4	Wood	Ell	Right	Cent	Plain, 3	Ball	Ball	Ball	Imperial, 34
Northeast	Disk	Sel	Unit M.	3	Bevel	Tor T	Float	3.50-1	126	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Plain	B&R	Ball	Imperial, 44-6
Northeast	Disk	Sel	Unit M.	3	Bevel	Rad R	Float	3.50-1	137	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Plain	Ball	Ball	Imperial, 54-6
Apco	Disk	Sel	Unit M.	4	Bevel	Springs	Float	3.50-1	132	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Inter-State, 45
Autolite	Cone	Sel	Unit M.	3	Bevel	Rad Rd.	Semi F	3.75-1	115	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	B&R	Ball	Jackson, Olympic
Autolite	Cone	Sel	Unit M.	3	Bevel	Rad Rd.	Float	3.50-1	124	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Jackson, Majestic
Autolite	Cone	Sel	Unit M.	3	Bevel	Rad Rd.	Float	4.00-1	132-38	36x4	36x4	Wood	Ell	Right	Right	Plain, 4	Ball	Ball	Ball	Jackson, Sultanic
U. S. L.	Cone	Sel	Amid	4	Bevel	Tor R	Float	4.08-1	116	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Roll	Jeffery, 93
U. S. L.	Cone	Sel	Amid	4	Bevel	Tor R	Float	3.92-1	128	36x4	36x4	Wood	Ell	Left	Cent	Plain, 4	Ball	Ball	Roll	Jeffery, 96
Ward-L'd	Disk	Sel	Unit M.	3	Bevel	Springs	Float	3.58-1	112	33x4	33x4	Wood	Cant	Left	Cent	Plain, 3	Roll	Roll	Ball	King, B
Esterline	Cone	Sel	Amid	4	Bevel	Springs	Float	4.00-1	121	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Plain	Roll	Roll	Kisselkar, 40
Esterline	Cone	Sel	Unit M.	4	Bevel	Springs	Float	4.00-1	132	36x4	36x4	Wood	Ell	Left	Cent	Plain, 4	Plain	Roll	Roll	Kisselkar, 48
Esterline	Cone	Sel	Amid	4	Bevel	Springs	Float	3.76-1	142	37x5	37x5	Wood	Ell	Left	Cent	Plain, 4	Plain	Roll	Roll	Kisselkar, 60

ABBREVIATIONS:—Clutch Type: Exp. Bd., expanding band; Con. Bd., contracting band. Gearset: Sel., selective; Prog., progressive; Plan., planetary; Fric., friction; Unit M., unit with the motor; Unit X., unit with the rear axle; Amid., amidships. Drive: Bevel, shaft with bevel gears in rear axle; Worm, shaft with worm gears in rear axle; Worm B, shaft with worm bevel gears in rear axle. Car Drives Through: Tor. T., torsion tube; Tor. R., torsion rod; Rad. Rd., radius rods; TTRR, torsion tube and radius rods. Rear Axle: Float, floating; Semi F., semi-floating; 1/2 Float, three-quarter floating. Gear Ratio: two speed rear axle. Wheels: Opt., optional. Springs: Ell., elliptic; 1/2 Ell., semi-elliptic; 3/4 Ell., three-quarter elliptic; Plat., platform. Gearshift: Elec., electrically operated. Bearings: Roll. roller; B. & R., ball and roller; B. & P., ball and plain; B. R. & P., ball, roller and plain.

# Passenger Car Chassis Listed for 1914, In

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, inches	S. A. E. H. P.	Piston Displacement Cubic inches	CYLINDERS		Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION		IGNITION			CARBURETION			CRANKING SYSTEM	
					Shape	How Cast				System	Type of Pump	System	Make	Control	Make of Carburetor	Fuel Feed	Is Hot Air Pipe Fitted?	Type	Make
Klinekar, 4-30	4	4.000x4.625	25.60	232.5	L-Head	Block.	Right.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Rushmore
Klinekar, 4-40	4	4.320x5.750	29.71	335.9	T-Head	Block.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Rushmore
Klinekar, 6-50	6	4.125x5.500	40.90	441.0	T-Head	Block.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Rushmore
Klinekar, 8-60	6	4.320x5.750	44.88	503.8	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Rushmore
Knox, 44	4	5.000x5.500	40.00	431.9	L-Head	Sep.	Head	Hel'l	Pump	Spl-Pres	Gear	Doub.	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Esterline
Knox, 45	4	5.000x5.500	40.00	431.9	L-Head	Sep.	Head	Hel'l	Pump	Spl-Pres	Gear	Doub.	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Esterline
Knox, 46	4	4.375x5.500	45.95	496.0	L-Head	Pairs.	Head	Chain	Pump	Spl-Pres	Gear	Doub.	Bosch	Hand.	Scott	Grav	Yes	Elec	Esterline
Knox, 66	6	5.000x5.500	60.00	647.8	L-Head	Pairs.	Head	Gear	Pump	Spl-Pres	Gear	Doub.	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Esterline
Krit, L	4	3.750x4.000	22.50	176.7	L-Head	Block.	Right.	Hel'l	Thermo	Splash	Flyw'l	Sing.	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Disco Ex.
Lambert, 46	4	3.750x5.250	22.50	231.9	L-Head	Block.	L & H	Hel'l	Pump	Spl-Pres	Piston	Dual	Briggs	Hand.	Schebler	Grav	Yes	Elec	Briggs
Lambert, 60	4	4.125x5.250	27.25	280.6	L-Head	Block.	L & H	Hel'l	Pump	Spl-Pres	Piston	Dual	Briggs	Hand.	Schebler	Grav	Yes	Elec	Disco
Lenox, 4	4	4.250x5.500	28.90	312.0	L-Head	Block.	Right.	Hel'l	Pump	Spl-Pres	Piston	Sing.	Eisemann	Hand.	Own.	Grav	No	Elec	Gray & Davis
Lenox, 6	6	4.000x5.000	38.60	376.9	T-Head	Threes	Opp.	Hel'l	Pump	Spl-Pres	Gear	Sing.	Eisemann	Hand.	Own.	Grav	No	Elec	Gray & Davis
Lewis, Six	6	3.500x6.000	29.40	346.4	L-Head	Block.	Right.	Chain	Pump	Splash	Flyw'l	Dual		Hand.		Grav	Yes	Elec	
Locomobile, 35-LD&RD	6	4.250x5.000	43.80	425.4	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Own.	Pres	Yes	Elec	Gray & Davis
Locomobile, 48-LD	6	4.250x5.000	48.60	524.8	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Own.	Pres	Yes	Elec	Gray & Davis
Locomobile, 48-RD	6	4.500x5.500	48.60	524.8	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Own.	Grav	Yes	Elec	Gray & Davis
Lozier, 77	6	3.875x5.500	36.06	389.1	L-Head	Threes	Right.	Hel'l	Pump	Spl-Pres	Gear	Sing.	Bosch	Hand.	Rayfield	Pres	Yes	Elec	Gray & Davis
Luverne, 7-60	6	4.000x5.000	38.60	376.9	L-Head	Pairs.	Left	Hel'l	Thermo	Splash	Gear	Dual	Bosch	Hand.	Rayfield	Grav	No	Air	Kellogg
Lyons-Knight, K-4	4	4.500x5.500	32.40	349.9	Knight	Pairs.	Sleeve	Chain	Pump	Pres	Piston	Dual	Simms	H & A.	Stromberg	Grav	Yes	Elec	Northeast
Marathon, Runner	4	3.500x4.500	19.60	173.2	L-Head	Pairs.	Right.	Hel'l	Thermo	Splash	Flyw'l	Dual	Remy	Hand.	Marvel	Grav	Yes	Elec	Jesco Ex
Marathon, Winner	4	4.250x4.500	28.90	255.3	L-Head	Pairs.	Right.	Hel'l	Thermo	Splash	Flyw'l	Dual	Remy	Hand.	Marvel	Grav	Yes	Elec	Jesco
Marathon, Champion	4	4.500x5.125	32.60	326.1	L-Head	Pairs.	Right.	Hel'l	Thermo	Splash	Flyw'l	Dual	Remy	Hand.	Marvel	Grav	Yes	Elec	Alpo
Marion, B	4	4.000x5.000	25.60	251.3	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pres	Gear	Dual	Spl'd'rf	Hand.	Rayfield	Grav	Yes	Elec	Westing'ae
Marion, G	6	3.750x5.000	33.75	332.4	L-Head	Threes	Right.	Hel'l	Pump	Spl-Pres	Gear	Dual	Spl'd'rf	Hand.	Rayfield	Pres	Yes	Elec	Westing'ae
Marmon, 32	4	4.500x5.000	32.40	318.1	T-Head	Pairs.	Opp.	Hel'l	Pump	Pres	Gear	2-Pt.	Bosch	Hand.	Zenith	Pres	Yes	Elec	Northeast
Marmon, 45	4	4.500x5.000	48.60	577.5	T-Head	Pairs.	Opp.	Hel'l	Pump	Pres	Gear	2-Pt.	Bosch	Hand.	Zenith	Pres	Yes	Elec	Northeast
Marmon, 41	6	4.250x5.500	43.80	468.0	L-Head	Threes	Right.	Hel'l	Pump	Pres	Gear	Dual	Bosch	Hand.	Zenith	Pres	Yes	Elec	Northeast
Maxwell, 25-4	4	3.625x4.500	20.25	185.8	L-Head	Block.	Right.	Hel'l	Thermo	Splash	Piston	Sing.	Simms	Hand.	Zephyr	Grav	Yes	Elec	
Maxwell, 35-4	4	4.000x4.750	25.60	238.8	L-Head	Block.	Left	Hel'l	Pump	Splash	Vacuum	Dual	Spl'd'rf	Hand.	Holley	Grav	Yes	Elec	Deaco
Maxwell, 50-6	6	4.125x4.750	40.90	380.4	L-Head	Block.	Opt.	Hel'l	Pump	Splash	Gear	Dual	Spl'd'rf	Hand.	Rayfield	Grav	Yes	Elec	Gray & Davis
McFarlan, T	6	4.000x6.000	38.40	452.4	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Noncir.	Sing.	Mea	Hand.	Stromberg	Pres	Yes	Air	Own.
Mercer, 35-J	4	4.375x5.000	30.63	300.7	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Rotary	2-Pt.	Bosch	Hand.	Fletcher	Pres	No	Elec	Rushmore
Mercer, 35-M	4	4.000x5.000	32.40	318.1	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Rotary	2-Pt.	Bosch	Hand.	Fletcher	Pres	No	Elec	Rushmore
Mercer, 35-H & O	4	4.500x5.000	32.40	318.1	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Rotary	2-Pt.	Bosch	Hand.	Fletcher	Pres	No	Elec	Rushmore
Meteor, M-30	4	4.000x5.000	25.60	251.3	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pres	Gear	Sing.	Remy	Hand.	Stromberg	Grav	Yes	Elec	Jesco Ex
Meteor, F-40	4	4.000x5.000	25.60	251.3	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pres	Gear	Sing.	At Kent	Hand.	Stromberg	Grav	Yes	Elec	Jesco
Meteor, W-6-45	6	3.750x5.000	33.60	331.4	L-Head	Pairs.	Left	Hel'l	Pump	Spl-Pres	Gear	Sing.	At Kent	Hand.	Stromberg	Grav	Yes	Elec	Jesco
Metropol, C	4	4.250x7.875	28.90	446.8	T-Head	Block.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Optional	Pres	No	Mech	Ev'r R'dy Ex
Metz	4	3.750x4.000	22.50	176.7	L-Head	Block.	Right.	Gear	Thermo	Splash	Gear	Sing.	Bosch	Hand.	Holley	Grav		Elec	Northeast Ex
Mitchell, Four	4	4.250x7.000	28.90	397.2	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Piston	Dual	Remy	Hand.	Rayfield	Grav	Yes	Elec	Remy
Mitchell, Little Six	6	4.250x6.7	43.80		T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Piston	Dual	Remy	Hand.	Rayfield	Grav	Yes	Elec	Remy
Mitchell, Big Six	6	4.250x7.000	43.80	595.8	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Piston	Dual	Remy	Hand.	Rayfield	Grav	Yes	Elec	Remy
Moline-Knight, 28-50	4	4.000x6.000	25.60	301.6	Knight	Block.	Sleeve	Chain	Thermo	Pres	Gear	Doub.	Bosch	Hand.		Pres	Yes	Elec	Wagner
Monarch, 4	4	3.190x5.000	16.27	159.6	L-Head	Block.		Gear	Thermo	Splash		Dual	Spl'd'rf	Hand.	Zephyr			Elec	Deaco Ex
Mondex Magic, 6-40	6	3.375x4.750	27.40	255.0	Special	Threes		Chain	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	C. R. G.	Pres	No	Elec	Westing'ae
Mondex Magic, 6-60	6	4.000x5.625	38.40	424.2	Special	Threes		Chain	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	C. R. G.	Pres	No	Elec	Westing'ae
Moon, 42	4	4.500x5.000	32.40	318.1	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Gear	Dual	Delco	Auto	Stromberg	Pres	Yes	Elec	Delco
Moon, 6-50	6	3.750x5.250	33.75	347.8	L-Head	Threes	Right.	Hel'l	Pump	Spl-Pres	Gear	Dual	Delco	Auto	Stromberg	Pres	Yes	Elec	Delco
Morse, D	4	4.625x5.000	34.25	336.0	L-Head	Sep.	Head	Spur	Pump	Splash	Gear	Dual	Eisemann	Hand.	Stromberg	Grav	Yes	Elec	Gray & Davis
Moyer, E	4	4.500x5.000	32.40	318.1	T-Head	Pairs.	Opp.	Hel'l	Pump	Pres	Gear	Sing.	Mea	Hand.	Carter	Grav	No	Elec	U. S. L.
Moyer, G	6	4.500x5.000	48.60	577.1	T-Head	Pairs.	Opp.	Hel'l	Pump	Pres	Gear	Sing.	Mea	Hand.	Carter	Grav	No	Elec	U. S. L.
National, 40	4	4.875x6.000	38.00	448.0	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Gear	2-Pt.	Bosch	Hand.	Rayfield	Pres		Elec	Gray & Davis
National, Six	6	3.750x5.500	33.75	364.4	L-Head	Block.	Right.	Hel'l	Pump	Spl-Pres	Gear	Dual		Hand.		Pres	Yes	Elec	Deaco
Norwalk, D**	6	3.875x5.000	36.06	353.7	T-Head	Threes	Opp.	Hel'l	Pump	Splash	Cent.	Sing.	At Kent	H & A.	Rayfield	Pres	Yes	Elec	Westing'ae
Norwalk, C**	6	4.000x5.500	38.40	414.8	T-Head	Threes	Opp.	Hel'l	Pump	Splash	Cent.	Sing.	At Kent	H & A.	Rayfield	Pres	Yes	Elec	Westing'ae
Oakland, 38	4	3.500x5.000	19.60	192.4	L-Head	Block.	Left	Hel'l	Pump	Splash	Piston	Dual	Delco	Hand.	Holley	Pres	Yes	Elec	Delco
Oakland, M-48	6	3.500x5.000	29.40	288.6	L-Head	Block.	Left	Hel'l	Pump	Splash	Piston	Dual	Delco	Hand.	Stromberg	Pres	Yes	Elec	Delco
Ohio, Ohio	4	4.250x4.750	28.90	269.4	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Piston	Dual	Spl'd'rf	Hand.	Optional	Grav	No	Elec	Jesco
Ohio, Royal	6	4.000x6.000	38.40	452.4	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Piston	Dual	Spl'd'rf	Hand.	Optional	Grav	No	Elec	Jesco
Oldsmobile, D-54	6	4.250x5.250	43.80	446.7	L-Head	Pairs.	Left	Chain	Pump	Splash	Piston	Sing.	Delco	Auto	Stromberg	Pres	Yes	Elec	Delco
Overland, 79	4	4.125x4.500	27.25	240.5	L-Head	Sep.	Left	Hel'l	Thermo	Splash	Gear	Dual	Spl'd'rf	Hand.	Schebler	Grav	Yes	Elec	Gray & Davis Ex
Packard, 238	6	4.000x5.500	38.40	414.7	L-Head	Threes	Right.	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Own.	Pres	Yes	Elec	Bijur
Paige, 25	4	3.750x4.000	22.50	176.7	L-Head	Block.	Left	Hel'l	Thermo	Splash	Piston	Sing.	Bosch	Hand.	Mayer	Grav	Yes	Elec	Disco
Paige, 38	4	4.000x5.000	25.60	251.3	L-Head	Block.	Left	Chain	Pump	Spl-Pres	Piston	Sing.	Bosch	Hand.	Stewart	Grav	No	Elec	Gray & Davis

\*\*Has Underclung Frame.

ABBREVIATIONS:—Cylinders: Sep., separate. Valve Location: Opp., opposite; Head, both valves in the head; S. & H., side and head. Cooling: Thermo, thermo-siphon. Lubrication: Spl-pres, splash pressure; Pres, pressure; Flyw'l, flywheel; Cent, centrifugal; Ecc, eccentric. Ignition: Sing, single; Dup'x, duplex, Doub, double; 2-Pt., two-point; Ex., extra; Westing'ae, Westinghouse; Spl'd'rf, Splitdorf; At Kent, Atwater Kent; Nat'l, National; Conn, Connecticut; Mich., Michigan; H. & A., hand and automatic; Auto, automatic. Fuel Feed: Grav., gravity; Pres, pressure; Grav. P., pressure and gravity. Cranking System: Elec., electric; Mech., mechanical; Acet, acetylene; Ex., extra.



## cluding Horsepower and Mechanical Details

Lighting System	TRANSMISSION								RUNNING GEAR					CON TROL		BEARINGS				MAKE AND MODEL
	Clutch Type	GEARSET		Forward Speeds	Final Drive	Car Drives Through	Rear Axle	Total Gear Ratio on Direct	Wheel-base	TIRES		Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	
		Type	Location							Front	Rear									
Rushmore	Cone	Sel	Amid	4	Bevel	Springs	Float	4.00-1	125	34x4	34x4	Wood	Ell	Right	Right	Plain, 5	Ball	Ball	Roll	Klinekar, 4-30
Rushmore	Cone	Sel	Amid	4	Bevel	Springs	Float	3.70-1	120	36x4	36x4	Opt	Ell	Left	Cent	Plain, 5	Ball	Ball	Ball	Klinekar, 4-40
Rushmore	Cone	Sel	Amid	4	Bevel	Springs	Float	3.70-1	128	37x4	37x4	Opt	Ell	Left	Cent	Ball, 7	Ball	Ball	Ball	Klinekar, 6-50
Rushmore	Cone	Sel	Amid	4	Bevel	Springs	Float	3.70-1	133	37x5	37x5	Wood	Ell	Left	Cent	Ball, 7	Ball	Ball	Ball	Klinekar, 6-80
Esterline	Diak	Sel	Unit M.	3	Bevel	Rad Rd	Float	3.30-1	117-22	36x4	36x4	Wood	Ell	Right	Cent	Plain, 5	Ball	Ball	Roll	Knox, 44
Esterline	Diak	Sel	Unit M.	3	Bevel	Rad Rd	Float	3.30-1	126	37x5	37x5	Wood	Ell	Opt	Cent	Plain, 5	Ball	Ball	Roll	Knox, 44
Esterline	Diak	Sel	Unit M.	3	Bevel	Springs	Float	3.50-1	134	38x5	38x5	Wood	Ell	Opt	Cent	Plain, 4	Ball	Ball	Roll	Knox, 46
Esterline	Diak	Sel	Unit M.	3	Bevel	Rad Rd	Float	3.00-1	134	38x5	38x5	Wood	Ell	Opt	Cent	Plain, 4	Ball	Ball	Roll	Knox, 66
Battery	Diak	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	108	32x3	32x3	Wood	Ell	Left	Left	Ball, 2	P&B	Roll	Ball	Krit, L
Briggs		Fric	Amid		Chain	Rad Rd	Semi F	3.60-1	112	32x3	32x3	Wood	Ell	Left	Right	Plain, 3		Roll	Ball	Lambert, 46
Disco		Fric	Amid		Chain	Rad Rd	Semi F	3.60-1	115	34x3	34x3	Wood	Ell	Right	Right	Plain, 3		Roll	Ball	Lambert, 60
Gray & Davis	Cone	Sel	Unit X.	3	Bevel	Tor T	Float		118	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Lenox, 4
Gray & Davis	Cone	Sel	Unit X.	3	Bevel	Tor T	Float		130	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Lenox, 6
	Diak	Sel	Unit M.	3	Bevel	Springs	Float	3.75-1	135	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Lewis, Six
Gray & Davis	Diak	Sel	Amid	4	Bevel	Rad Rd	Float	3.54-1	132-28	36x5	36x5	Wood	Ell	Opt	Opt	Plain, 7	Ball	Ball	Roll	Locomobile, 38-LD&RD
Gray & Davis	Diak	Sel	Amid	4	Bevel	Rad Rd	Float	3.54-1	140	36x5	37x5	Wood	Ell	Left	Cent	Plain, 7	Ball	Ball	Roll	Locomobile, 48-LD
Gray & Davis	Diak	Sel	Amid	4	Bevel	Rad Rd	Float	3.54-1	136	36x4	37x5	Wood	Ell	Right	Right	Plain, 7	Ball	Ball	Roll	Locomobile, 48-RD
Gray & Davis	Diak	Sel	Unit M.	3	Bevel	Springs	Float	3.75-1	127	36x4	36x4	Wood	Plat	Left	Cent	Plain, 3	Ball	Ball	Ball	Lozier, 77
Vesta	Diak	Sel	Unit M.	3	Bevel	Rad Rd	Float	3.75-1	130	36x4	36x4	Wood	Ell	Left	Cent	Plain, 5	Ball	B&R	Roll	Luverna, 7-60
Northeast	Diak	Sel	Unit X.	3	Worm	Tor T	Float	3.85-1	130	37x5	37x5	Wood	Ell	Left	Cent	Plain, 5	Ball	Roll	Roll	Lyons-Knight, K-4
Jesco Ex	Diak	Sel	Unit M	3	Bevel	Springs	Semi F	4.00-1	104	32x3	32x3	Wood	Ell	Right	Right	Plain, 3	Ball	Roll	Ball	Marathon, Runner
Jesco	Diak	Sel	Unit M.	3	Bevel	Springs	Float	4.00-1	118	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	Roll	Ball	Marathon, Winner
Apico	Diak	Sel	Unit M.	3	Bevel	Springs	Float	4.00-1	126	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Ball	Roll	Ball	Marathon, Champion
Westingse	Cone	Sel	Unit X.	3	Bevel	Tor T	Float	3.70-1	117	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	B&R	Ball	Marion, B
Westingse	Disk	Sel	Unit X.	3	Bevel	Tor T	Float	3.70-1	124	35x4	35x4	Wood	Ell	Left	Cent	Plain, 3	Roll	B&R	Ball	Marion, G
Northeast	Cone	Sel	Unit X.	3	Bevel	Tor T	Semi F	3.40-1	120	35x4	35x4	Wood	Ell	Left	Cent	Plain, 3	Ball	B&R	Roll	Marmon, 32
Northeast	Diak	Sel	Unit X.	3	Bevel	Tor T	Semi F	3.46-1	145	36x4	37x5	Wood	Ell	Left	Cent	Plain, 7	Roll	B&R	Roll	Marmon, 48
Northeast	Cone	Sel	Amid	3	Bevel	Tor R	Float	3.60-1	132	35x5	35x5	Wood	Ell	Left	Cent	Plain, 7	Roll	Roll	Roll	Marmon, 41
	Cone	Sel	Amid	3	Bevel	Springs	Float	3.58-1	103	30x3	30x3	Wood	Ell	Left	Cent	Plain, 2	P&R	Roll	Ball	Maxwell, 25-4
Deaco	Cone	Sel	Unit X.	3	Bevel	Tor T	Semi F	3.53-1	110	33x4	33x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Roll	Ball	Maxwell, 35-4
Gray & Davis	Cone	Sel	Unit X.	3	Bevel	Tor T	Float	3.69-1	130	36x4	36x4	Wood	Ell	Opt	Opt	Plain, 3	Roll	Roll	Roll	Maxwell, 50-6
Vesta	Diak	Sel	Unit X.	3	Bevel	Tor T	Float	3.50-1	128	36x4	36x4	Wood	Ell	Left	Cent	Plain, 4	Roll	B&R	Ball	McFarlan, T
	Diak	Sel	Amid	4	Bevel	Rad Rd	Float	2.52-1	108	32x4	32x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Mercer, 35-J
Rushmore	Diak	Sel	Amid	4	Bevel	Rad Rd	Float	3.00-1	124	34x4	35x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Mercer, 35-M
Rushmore	Diak	Sel	Amid	4	Bevel	Rad Rd	Float	2.82-1	118	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Mercer, 35-H & O
Jesco Ex	Diak	Sel	Unit M.	3	Bevel	Tor T	Float	3.75-1	116	34x3	34x3	Wood	Ell	Right	Cent	Plain, 3	Ball	Roll	Ball	Meteor, M-36
Jesco	Diak	Sel	Unit M.	3	Bevel	Tor T	Float	3.75-1	118	34x3	34x3	Wood	Ell	Right	Cent	Plain, 3	Ball	Roll	Ball	Meteor, F-40
Jesco	Diak	Sel	Unit M.	3	Bevel	Tor T	Float	3.75-1	122	35x4	35x4	Wood	Ell	Right	Cent	Plain, 3	Ball	Roll	Ball	Meteor, W-6-45
	Cone	Sel	Amid	3	Bevel	Tor T	Float	2.50-1	115	33x4	33x4	Wood	Ell	Right	Right	B&P, 3	Ball	Ball	Ball	Metropol, C
Northeast Ex		Fric			Chain		Dead		90	30x3	30x3	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Metz
Remy	Cone	Sel	Amid	3	Bevel	Tor T	Float	3.35-1	120	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	B&R	B&R	Roll	Mitchell, Four
Remy	Cone	Sel	Amid	3	Bevel	Tor T	Float	3.35-1	132	36x4	36x4	Wood	Ell	Left	Cent	Plain, 4	B&R	B&R	Roll	Mitchell, Little Six
Remy	Cone	Sel	Amid	3	Bevel	Tor T	Float	3.35-1	144	37x5	37x5	Wood	Ell	Left	Cent	Plain, 4	B&R	B&R	Roll	Mitchell, Big Six
Wagner	Cone	Sel	Unit M	3	Bevel	Tor T	Float	4.25-1	128	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Ball	Ball	Moline-Knight, 28-50
Deaco Ex	Cone	Sel		3	Bevel				110	32x3	32x3		Ell	Left	Cent					Monarch, 4
Westingse	Disk	Sel	Amid	4	Bevel	Springs	Float	3.66-1	134	36x4	36x4	Wire	Ell	Left	Cent	Plain, 7	Ball	Roll	Roll	Mondex Magic, 6-40
Westingse	Disk	Sel	Amid	4	Bevel	Springs	Float	3.66-1	140	37x5	37x5	Wire	Ell	Left	Cent	Plain, 7	Ball	Roll	Roll	Mondex Magic, 6-60
Delco	Diak	Sel	Amid	3	Bevel	Springs	Float	3.50-1	118	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	B&R	Roll	Moon, 42
Delco	Diak	Sel	Unit M	4	Bevel	Springs	Float	3.80-1	129	35x4	35x4	Wood	Ell	Left	Cent	Plain, 3	Roll	B&R	Roll	Moon, 6-50
Gray & Davis	Diak	Sel	Amid	4	Bevel	Tor T	Float	3.38-1	127	36x4	36x4	Wood	Ell	Right	Right	Plain, 5	Ball	Ball	Ball	Morse, D
U. S. L.	Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	121	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Roll	Ball	Roll	Moyer, E
U. S. L.	Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.36-1	135	35x4	35x4	Wood	Ell	Right	Right	Plain, 3	Roll	Ball	Roll	Moyer, G
Gray & Davis	Cone	Sel	Amid	3	Bevel	Springs	Float	3.00-1	120-28	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	National, 40
Deaco	Cone	Sel	Amid	3	Bevel	Springs	Float	4.00-1	132	36x4	36x4	Wood	Cent	Left	Cent	Plain, 4	Ball	Roll	Roll	National, Six
Westingse	Diak	Sel	Unit M.	4	Bevel	Springs	Float	3.80-1	131	37x4	37x4	Opt	Ell	Left	Elec	Plain, 3	Ball	Ball	Ball	Norwalk, D**
Westingse	Diak	Sel	Unit M.	4	Bevel	Springs	Float	3.80-1	136	39x5	39x5	Wood	Ell	Left	Elec	Plain, 3	Ball	Ball	Ball	Norwalk, C**
Delco	Cone	Sel	Unit M.	3	Bevel	Springs	Semi F	3.50-1	112	33x4	33x4	Wood	Ell	Left	Cent	Plain, 3	B&R	Roll	Ball	Oakland, 36
Delco	Cone	Sel	Unit M.	3	Bevel	Tor R	Float	3.50-1	123	35x4	35x4	Wood	Ell	Left	Cent	Plain, 4	B&R	Roll	Ball	Oakland, M-48
Jesco	Diak	Sel	Unit M.	3	Bevel	Springs	Semi F	4.00-1	116	34x4	34x4	Wood	Ell	Right	Cent	Plain, 3	B&R	Roll	Ball	Ohio, Ohio
Jesco	Diak	Sel	Unit M.	4	Bevel	Springs	Float	3.50-1	132	35x4	35x4	Wood	Ell	Left	Cent	Plain, 4	B&R	Ball	Ball	Ohio, Royal
Delco	Cone	Sel	Unit M.	3	Bevel	Springs	Float	3.80-1	132-39	36x5	36x5	Opt	Ell	Right	Right	Plain, 4	Ball	Ball	Roll	Oldsmobile, D-54
Gray & Davis Ex	Cone	Sel	Unit X.	3	Bevel	Tor T	Float	Opt	114	33x4	33x4	Wood	Ell	Right	Cent	Plain, 5	Ball	Roll	Roll	Overland, 79
Bijur	Diak	Prog	Unit X.	3	Worm B.	Rad Rd	Semi F		140	36x4	37x5	Wood	Ell	Left	Left	Plain, 7	Ball	Ball	Roll	Packard, 238
Disco	Diak	Sel	Unit M.	3	Bevel	Rad Rd	Semi F	4.00-1	110	32x3	32x3	Wood	Ell	Right	Right	Plain, 2	B&R	Roll	Ball	Paige, 25
Gray & Davis	Diak	Sel	Unit M.	3	Bevel	Rad Rd	Float	3.79-1	116	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	B&R	B&R	Ball	Paige, 36

ABBREVIATIONS:—Clutch Type: Exp. Bd., expanding band; Con. Bd., contracting band. Gearset: Sel., selective; Prog., progressive; Plan., planetary; Fric., friction; Unit M., unit with the motor; Unit X., unit with the rear axle; Amid., amidships. Drive: Bevel, shaft with bevel gears in rear axle; Worm, shaft with worm gears in rear axle; Worm B., shaft with worm bevel gears in rear axle. Car Drives Through: Tor. T., torsion tube; Tor. R., torsion rod; Rad. Rd., radius rods; TTRR., torsion tube and radius rods. Rear Axle: Float, floating; Semi F., semi-floating; Float., three-quarter floating. Gear Ratio: two speed rear axle. Wheels: Opt., optional. Springs: Ell., elliptic; Ell., semi-elliptic; Ell., three-quarter elliptic; Plat., platform. Gearshift: Elec., electrically operated; Bearings: Roll, roller; B. & R., ball and roller; B. & P., ball and plain; B. R. & P., ball, roller and plain.

# Passenger Car Chassis Listed for 1914, In

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		Valve Location	Camshaft Drive	Cooling Circulation	LUBRICATION		IGNITION			CARBURETION			CRANKING SYSTEM	
					Shape	How Cast				System	Type of Pump	System	Make	Control	Make of Carburetor	Fuel Feed	In Hot Air Pipe Fitted?	Type	Make
Palmer-Singer	6	4.000x5.000	38.40	376.9	T-Head	Threes	Opp.	Hel'l	Pump	Splash	Gear	Dual	Eisemann	Hand.	C. R. G.	Pres	No	Elec	Westing'ae
Palmer-Singer, 50	6	4.000x5.500	38.40	414.7	T-Head	Threes	Opp.	Hel'l	Pump	Splash	Gear	Dual	Eisemann	Hand.	C. R. G.	Pres	No	Elec	Westing'ae
Partin-Palmer, 38	4	3.500x5.000	19.60	192.4	L-Head	Block.	Head	Hel'l	Thermo	Splash	Gear	Dual	Briggs	Hand.	Stromberg	Grav	Yes	Elec	AutoliteEx.
Paterson, 33	4	3.500x5.000	19.60	192.4	L-Head	Block.	Left	Hel'l	Pump	Spl-Pres	Piston	Doub	Connect	Hand.	Marvel	Grav	Yes	Elec	Autolite
Pathfinder, 14	4	4.125x5.250	27.25	280.6	L-Head	Block.	Left	Hel'l	Thermo	Pres	Piston	Dual	Eisemann	Hand.	Schebler	Grav P	Yes	Elec	Gray & Davis
Pathfinder, Leather Stock'g	4	4.125x5.250	40.90	420.9	L-Head	Threes	Right	Hel'l	Pump	Spl-Pres	Gear	Sing	Mea	Hand.	Schebler	Grav	Yes	Elec	Gray & Davis
Peerless, 38-6	6	4.000x5.500	38.40	414.7	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Piston	Dual	Bosch	Hand.	Own	Pres	No	Elec	Gray & Davis
Peerless, 48-6	6	4.500x6.000	48.60	577.5	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Piston	Dual	Bosch	Hand.	Own	Pres	No	Elec	Gray & Davis
Peerless, 66	6	5.000x7.000	60.00	824.8	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Piston	Dual	Bosch	Hand.	Own	Pres	No	Elec	Gray & Davis
Pierce-Arrow, 38 C-2	6	4.000x5.500	38.40	414.7	T-Head	Pairs.	Opp.	Hel'l	Pump	Pres	Gear	Doub	Bosch	Hand.	Own	Grav	Yes	Elec	Pierce-West.
Pierce-Arrow, 48 B-2	6	4.500x6.000	48.60	577.5	T-Head	Pairs.	Opp.	Hel'l	Pump	Pres	Gear	Doub	Bosch	Hand.	Own	Grav	Yes	Elec	Pierce-West.
Pierce-Arrow, 66 A-2	6	5.000x7.000	60.00	824.8	T-Head	Pairs.	Opp.	Hel'l	Pump	Pres	Gear	Doub	Bosch	Hand.	Own	Grav	Yes	Elec	Pierce-West.
Pilot, 50	4	4.500x6.000	32.40	381.7	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Noncir	Dual	Eisemann	Hand.	Optional	Grav	Yes	Elec	Gray & Davis
Pilot, 60	6	4.000x6.000	38.40	452.4	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Noncir	Dual	Eisemann	Hand.	Optional	Grav	Yes	Elec	Gray & Davis
Pratt, 4-50	4	4.500x5.750	32.40	365.8	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Piston	Dual	Bosch	Hand.	Holley	Grav	Yes	Elec	Gray & Davis
Premier Six	6	3.625x5.500	31.60	340.7	L-Head	Block.	Head	Hel'l	Pump	Spl-Pres	Gear	Sing	Eisemann	Hand.	Carter	Pres	Yes	Elec	Remy
Premier, 6-48	6	4.000x5.500	38.40	414.7	T-Head	Threes	Opp.	Hel'l	Pump	Spl-Pres	Gear	Sing	Eisemann	Hand.	Carter	Pres	Yes	Elec	Remy
Pullman, 4-38	4	4.063x5.000	27.10	265.7	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Ecc	Dual	Bosch	Hand.	Stromberg	Grav	No	Elec	Westing'ae
Pullman, 4-44	4	4.375x5.500	30.63	330.7	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Ecc	Dual	Bosch	Hand.	Stromberg	Grav	No	Elec	Westing'ae
Pullman, 6-48	6	3.750x5.250	33.75	347.8	L-Head	Threes	Right	Hel'l	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Westing'ae
Pullman, 6-66	6	4.375x5.500	45.95	496.0	T-Head	Pairs.	Opp.	Hel'l	Pump	Splash	Ecc	Dual	Bosch	Hand.	Stromberg	Grav	No	Elec	Westing'ae
Rayfield, D	6	4.000x5.500	38.40	414.7	L-Head	Block.	Left	Chain	Thermo	Pres	Gear	Sing	Mea	Hand.	Rayfield	Pres	Yes	Elec	Undecided
Read, 30	4	3.500x4.000	19.60	153.9	L-Head	Block.	Left	Hel'l	Thermo	Splash	Piston	Sing	Bosch	Fixed	Stromberg	Grav	Opt. Ex.	Opt Ex.	
Regal, T. N. NC**	4	3.750x4.500	22.50	198.8	L-Head	Block.	Left	Hel'l	Thermo	Spl-Pres	Piston	Dual	Mich	Hand.	Schebler	Grav	No	Elec	Rushmore
Regal, C**	4	4.000x5.000	25.60	251.3	L-Head	Block.	Left	Hel'l	Thermo	Spl-Pres	Piston	Dual	Mich	Hand.	Schebler	Grav	No	Elec	Rushmore
Reo, Fifth	4	4.000x4.500	25.60	226.2	L-Head	Pairs.	S & H	Hel'l	Pump	Spl-Pres	Piston	Dual	Remy	Hand.	Holley	Grav	Yes	Elec	Remy
Republic, E	6	4.250x5.000	43.80	425.4	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Delco	Hand.	Carter	Pres	No	Elec	Delco
Richmond, R.	4	4.125x5.000	27.25	267.3	L-Head	Block.	Left	Hel'l	Pump	Splash	Gear	Dual	Mich	Hand.	Kingston	Grav	Yes	Elec	Jesco
Richmond, S	4	4.500x5.000	32.40	318.1	L-Head	Sep	Left	Hel'l	Pump	Splash	Gear	Dual	Mich	Hand.	Kingston	Grav	Yes	Elec	Jesco
Richmond, T	6	4.000x4.500	38.40	339.3	L-Head	Sep	Left	Hel'l	Pump	Splash	Gear	Dual	Mich	Hand.	Kingston	Grav	Yes	Elec	Jesco
Selden, 49	4	4.750x5.000	36.10	354.4	L-Head	Pairs.	Left	Hel'l	Pump	Splash	Gear	Doub	Bosch	Hand.	Stromberg	Grav	No	Elec	Gray & Davis
S. G. V., F	4	3.750x6.000	22.50	265.0	L-Head	Block.	Right	Gear	Pump	Pres	Gear	Sing	Bosch	Hand.	Zenith	Pres	Yes	Elec	U. S. L.
Simplex, 38	4	4.875x6.500	38.00	485.3	T-Head	Pairs.	Opp.	Spur	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Own	Pres	Yes	Elec	Rushmore
Simplex, 75	4	5.375x6.500	46.00	590.0	T-Head	Pairs.	Opp.	Spur	Pump	Spl-Pres	Gear	2-Pt.	Bosch	Hand.	Own	Pres	Yes	Elec	Rushmore
Simplex, 50	4	5.375x6.500	46.00	590.0	T-Head	Pairs.	Opp.	Spur	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Own	Pres	Yes	Elec	Rushmore
S. & M., 14-48	6	3.750x5.250	33.75	347.8	L-Head	Threes	Right	Hel'l	Pump	Splash	Gear	Dual	Bosch	Hand.	Rayfield	Pres	Yes	Elec	Rushmore
Spaulding, H	4	4.250x5.500	28.90	321.0	L-Head	Block.	Right	Hel'l	Pump	Splash	Piston	Dual	Simms	Hand.	Holley	Grav P	No	Elec	Entz
Speedwell, H	6	4.125x5.250	40.90	420.9	L-Head	Threes	Right	Hel'l	Pump	Splash	Piston	Dual	Bosch	Hand.	Stromberg	Pres	Yes	Elec	Wagner
Spoerer, 40	4	4.875x5.500	38.00	410.6	T-Head	Pairs.	Opp.	.....	Pump	Pres	Gear	Dual	Bosch	Hand.	Stromberg	Pres	No	Elec	Gray & Davis
Staver, 45-A	4	4.500x6.000	32.40	381.7	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Piston	Dual	Simms	Hand.	Rayfield	Pres	Yes	Elec	Esterline
Staver, 65-A	6	4.000x6.000	38.40	452.4	T-Head	Block.	Opp.	Hel'l	Pump	Splash	Piston	Dual	Simms	Hand.	Rayfield	Pres	Yes	Elec	Esterline
Stearns-Knight, Four	4	4.250x5.500	28.90	312.0	Knight	Pairs.	Sleeve	Chain	Pump	Spl-Pres	Gear	Dup'x	Bosch	Hand.	Stromberg	Pres	Yes	Elec	Gray & Davis
Stearns-Knight, Six	6	4.250x5.750	43.80	489.4	Knight	Pairs.	Sleeve	Chain	Pump	Spl-Pres	Gear	Dup'x	Bosch	Hand.	Stromberg	Pres	Yes	Elec	Gray & Davis
Studebaker, Four	4	3.500x5.000	19.60	192.4	L-Head	Block.	Left	Hel'l	Pump	Splash	Piston	Dual	Remy	Hand.	Schebler	Grav	Yes	Elec	Stude-Wag'r.
Studebaker, Six	6	3.500x5.000	29.40	288.6	L-Head	Block.	Left	Hel'l	Pump	Splash	Piston	Dual	Remy	Hand.	Schebler	Grav	Yes	Elec	Stude-Wag'r.
Stutz, 4-E	4	4.750x5.500	36.10	389.9	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Spl'd'rf.	Hand.	Stromberg	Pres	Yes	Elec	Stutz-Remy
Stutz, 4-E	4	4.750x5.500	36.10	389.9	T-Head	Pairs.	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Spl'd'rf.	Hand.	Stromberg	Pres	Yes	Elec	Stutz-Remy
Stutz, 6-E	6	4.000x5.000	38.40	376.9	T-Head	Threes	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Spl'd'rf.	Hand.	Stromberg	Pres	Yes	Elec	Stutz-Remy
Stutz, 6-E	6	4.000x5.000	38.40	376.9	T-Head	Threes	Opp.	Hel'l	Pump	Spl-Pres	Gear	Dual	Spl'd'rf.	Hand.	Stromberg	Pres	Yes	Elec	Stutz-Remy
Touraine, 12	6	4.000x5.500	38.40	414.7	T-Head	Threes	Opp.	Hel'l	Pump	Splash	Gear	Dual	Bosch	Hand.	Fletcher	Pres	Yes	Elec	Gray & Davis
Tribuna, A	4	4.250x5.500	28.90	312.0	L-Head	Block.	Right	Spur	Pump	Spl-Pres	Gear	Dual	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Undecided
Vaughan, Six	6	3.750x5.500	33.75	364.4	L-Head	Block.	Right	Hel'l	Pump	Spl-Pres	.....	Sing	Mea	Hand.	Rayfield	Pres	Yes	Elec	Bijur
Vello, 5	4	4.000x5.500	25.60	276.5	L-Head	Pairs.	Left	Chain	Thermo	Splash	Piston	Dual	Bosch	Hand.	Stromberg	Grav	Yes	Elec	Gray & Davis
Vello, 8	4	4.025x5.250	34.25	352.8	L-Head	Pairs.	Left	Chain	Pump	Splash	Piston	Dual	Bosch	Hand.	Stromberg	Pres	Yes	Elec	Gray & Davis
Vello, 10	6	3.750x5.250	33.75	347.8	L-Head	Threes	Right	Hel'l	Pump	Splash	Piston	Dual	Bosch	Hand.	Stromberg	Pres	Yes	Elec	Gray & Davis
Vulcan, 27	4	3.375x5.000	18.25	178.9	L-Head	Block.	Right	Gear	Thermo	Spl-Pres	Piston	Sing	.....	Fixed	.....	Grav	Yes	Elec	Gray & Davis Ex.
White, GAF	4	3.750x5.125	22.50	226.4	L-Head	Block.	Right	Hel'l	Pump	Spl-Pres	Gear	Sing	Bosch	Hand.	Own	Grav	Yes	Elec	White-Entz
White, GEB	4	4.250x5.750	28.90	326.3	L-Head	Block.	Right	Hel'l	Pump	Spl-Pres	Gear	Sing	Bosch	Hand.	Own	Grav	Yes	Elec	White-Entz
White, GF	6	4.250x5.750	43.80	489.4	L-Head	Block.	Right	Hel'l	Pump	Spl-Pres	Gear	Sing	Bosch	Hand.	Own	Grav	Yes	Elec	White-Entz
Willys-Knight, K-17	4	4.000x5.500	25.60	276.5	Knight	Pairs.	Sleeve	Chain	Pump	Pres	Piston	Sing	Simms	Hand.	S. U.	Pres	Yes	Elec	U. S. L.
Winton, 20	6	4.500x5.500	48.60	529.8	L-Head	Pairs.	Right	Hel'l	Pump	Pres	Piston	Dual	Opt	Hand.	Stromberg	Pres	Yes	Air	Own
Zimmerman, D&E	2	4.500x4.000	16.20	127.2	L-Head	Sep	Side	.....	Air	Spl-Pres	.....	Sing	Batt	Hand.	Schebler	Grav	No	Opt	Opt
Zimmerman, B-8	6	4.000x5.000	38.40	376.9	L-Head	Pairs.	Left	Hel'l	Pump	Splash	.....	Dual	Remy	Hand.	Schebler	Pres	No	Opt	Opt

\*\*Has Underslung Frame.

ABBREVIATIONS:—Cylinders: Sep., separate. Valve Location: Opp., opposite; Head, both valves in the head; S. & H., side and head. Cooling: Thermo, thermo-siphon. Lubrication: Spl-pres, splash pressure; Pres, pressure; Flyw'l, flywheel; Cent, centrifugal; Ecc, eccentric. Ignition: Sing, single; Dup'x, duplex, Doub., double; 2-Pt., two-point; Westing'ae, Westinghouse; Spl'd'rf, Splitorf; At Kent, Atwater Kent; Nat'l, National; Connect, Connecticut; Mich., Michigan; H. & A., hand and automatic; Auto, automatic. Fuel Feed: Grav., gravity; Pres, pressure; Grav. P., pressure and gravity. Cranking System: Elec., electric; Mech., mechanical; Acet, acetylene; Ex, extra.



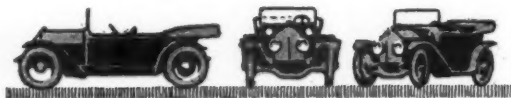
# Including Horsepower and Mechanical Details

Lighting System	TRANSMISSION								RUNNING GEAR				CONTROL		BEARINGS				MAKE AND MODEL	
	Clutch Type	GEARSET			Final Drive	Car Drives Through	Rear Axle	Total Gear Ratio on Direct	Wheel-base	TIRES		Wheels	Rear Springs	Location Steering Wheel	Gearshift Location	Crankshaft Type and No.	Gearset	Rear Axle		Front Wheel
		Type	Location	Forward Speeds						Front	Rear									
Westing'ae	Disk	Sel	Unit X	3	Bevel	T T R R	Float	3.75-1	123	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Palmer-Singer
Westing'ae	Disk	Sel	Unit X	3	Bevel	T T R R	Float	3.75-1	134	36x4	36x4	Opt	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Palmer-Singer, 50
Autolite Ex	Cone	Sel	Unit X	3	Bevel	T T R R	Float	3.80-1	115	32x3	32x3	Wood	Ell	Left	Cent	Plain, 3	Roll	Roll	Ball	Partin-Palmer, 38
Autolite	Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	112	32x3	32x3	Wood	Ell	Left	Cent	Plain, 3	Ball	B&R	Ball	Paterson, 33
Gray & Davis	Cone	Sel	Unit M	3	Bevel	Tor T	Float	4.00-1	120	35x4	35x4	Wood	Ell	Right	Right	Plain, 3	Roll	B&R	Roll	Pathfinder, 14
Gray & Davis	Disk	Sel	Unit M	4	Bevel	Tor T	Float	3.77-1	135	35x5	35x5	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Roll	Pathfinder, Leather Stock'g
Gray & Davis	Exp Bd.	Sel	Amid	4	Bevel	Rad Rd	Float	3.56-1	125	36x4	36x4	Wood	Plat	Opt	Opt	Plain, 7	Ball	B&R	Roll	Peerless, 38-6
Gray & Davis	Exp Bd.	Sel	Amid	4	Bevel	Rad Rd	Float	3.17-1	137	36x4	37x5	Wood	Plat	Opt	Opt	Plain, 7	Ball	B&R	Roll	Peerless, 48-6
Gray & Davis	Exp Bd.	Sel	Amid	4	Bevel	Rad Rd	Float	2.59-1	140	38x5	38x5	Wood	Plat	Opt	Opt	Plain, 7	Ball	B&R	Roll	Peerless, 66
Pierce-West.	Cone	Sel	Amid	4	Bevel	Springs	Semi F	127-32	36x4	36x4	Wood	Ell	Right	Right	Plain, 7	Ball	B&R	Roll	Pierce-Arrow, 35 C-2	
Pierce-West.	Cone	Sel	Amid	4	Bevel	Springs	Semi-F	134-42	37x5	37x5	Wood	Ell	Right	Right	Plain, 7	Ball	B&R	Roll	Pierce-Arrow, 43 B-2	
Pierce-West.	Cone	Sel	Amid	4	Bevel	Springs	Semi F	140-47	37x5	38x5	Wood	Ell	Right	Right	Plain, 7	Ball	B&R	Roll	Pierce-Arrow, 66 A-2	
Gray & Davis	Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	126-20	37x4	37x4	Wood	Ell	Opt	Cent	Plain, 3	Ball	Ball	Ball	Pilot, 50
Gray & Davis	Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	132	37x4	37x4	Wood	Ell	Opt	Cent	Plain, 4	Ball	Ball	Ball	Pilot, 60
Gray & Davis	Disk	Sel	Unit M	3	Bevel	Springs	Float	4.00-1	122	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Roll	Roll	Roll	Pratt, 4-50
Remy	Disk	Sel	Unit M	3	Bevel	Springs	Float	3.79-1	132	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Roll	B&R	Roll	Premier 6-48
Remy	Disk	Sel	Unit M	3	Bevel	Springs	Semi F	3.79-1	132	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Roll	B&R	Roll	Premier, 6-48
Westing'ae	Cone	Sel	Amid	3	Bevel	Springs	Float	3.75-1	118	34x4	34x4	Wood	Ell	Opt	Opt	Plain, 3	Ball	Roll	Roll	Pullman, 4-36
Westing'ae	Cone	Sel	Amid	4	Bevel	Springs	Float	3.75-1	122	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Pullman, 4-44
Westing'ae	Disk	Sel	Unit M	4	Bevel	Springs	Float	130	36x4	36x4	Wire	Ell	Left	Elec	Cent	Plain, 3	Ball	Roll	Roll	Pullman, 6-46
Westing'ae	Cone	Sel	Amid	4	Bevel	Springs	Float	3.75-1	138	37x5	37x5	Wood	Ell	Left	Cent	Plain, 4	Ball	Roll	Roll	Pullman, 6-66
Undecided	Disk	Sel	Unit M	4	Bevel	Rad Rd	Float	3.50-1	130	36x4	36x4	Opt	Ell	Right	Right	Plain, 4	Ball	Ball	Ball	Rayfield, D
Acet	Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	115	32x3	32x3	Wood	Ell	Left	Cent	Plain, 2	Plain	Roll	Ball	Read, 30
Rushmore	Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	3.23-1	108	32x3	32x3	Wood	Ell	Left	Cent	Plain, 2	Roll	Roll	Ball	Regal, T. N. NC**
Rushmore	Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.08-1	116	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Roll	Ball	Regal, C**
Remy	Disk	Sel	Amid	3	Bevel	Springs	Semi F	3.70-1	112	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Roll	Roll	Reo, Fifth
Delco	Cone	Sel	Amid	4	Bevel	Rad Rd	Float	4.00-1	133	36x4	36x4	Wood	Ell	Left	Cent	Plain, 4	Ball	Ball	Ball	Republic, E
Jesco	Cone	Sel	Amid	3	Bevel	Springs	Semi F	4.00-1	114	34x4	34x4	Wood	Ell	Right	Cent	Plain, 5	Ball	Ball	Ball	Richmond, R
Jesco	Cone	Sel	Amid	3	Bevel	Springs	Semi F	4.00-1	117	34x4	34x4	Wood	Ell	Right	Cent	Plain, 5	Ball	Ball	Ball	Richmond, S
Jesco	Cone	Sel	Amid	3	Bevel	Springs	Semi F	Opt	123	34x4	34x4	Wood	Ell	Right	Cent	Plain, 7	Ball	Ball	Ball	Richmond, T
Gray & Davis	Disk	Sel	Amid	3	Bevel	Tor R	Float	3.50-1	125	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Roll	Ball	Ball	Selden, 49
U. S. L.	Disk	Sel	Unit M	4	Bevel	Springs	Semi F	4.00-1	120	35x4	35x4	Wood	Ell	Left	Elec	Plain, 3	Ball	Ball	Ball	S. G. V., F
Rushmore	Disk	Sel	Amid	4	Bevel	Tor T	Semi F	2.75-1	137	35x5	35x5	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Simplex, 38
Rushmore	Disk	Sel	Amid	4	Chain	Rad Rd	Dead	2.13-1	129	36x4	36x4	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Simplex, 75
Rushmore	Disk	Sel	Amid	4	Chain	Rad Rd	Dead	2.13-1	137	36x4	37x5	Wood	Ell	Right	Right	Plain, 3	Ball	Ball	Ball	Simplex, 50
Rushmore	Disk	Sel	Unit M	4	Bevel	Tor T	Float	Opt	130	34x4	34x4	Wire	Ell	Left	Cent	Plain, 3	Roll	Roll	Roll	S. & M., 14-48
Entz	Cone	Sel	Amid	3	Bevel	Tor T	Float	3.75-1	120	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Spaulding, H
Wagner	Disk	Sel	Unit M	3	Bevel	Springs	Float	Opt	135	37x5	37x5	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Speedwell, H
Gray & Davis	Cone	Sel	Unit M	3	Bevel	T T R R	Float	Opt	120	37x4	37x4	Wood	Ell	Right	Right	Plain, 3	Ball	Roll	Roll	Spoerer, 40
Esterline	Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	120	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Ball	Ball	Staver, 45-A
Esterline	Cone	Sel	Amid	4	Bevel	Springs	Float	3.50-1	138	37x4	37x4	Wood	Ell	Left	Cent	Plain, 4	Ball	Ball	Ball	Staver, 65-A
Gray & Davis	Disk	Sel	Unit M	3	Bevel	Springs	Float	3.90-1	121-27	33x4	36x4	Wood	Ell	Left	Cent	Plain, 5	Ball	Roll	Roll	Stearns-Knight, Four
Gray & Davis	Disk	Sel	Unit M	4	Bevel	Springs	Float	3.40-1	134-40	37x5	37x5	Wood	Ell	Left	Cent	Plain, 7	Ball	Roll	Roll	Stearns-Knight, Six
Stud-Wagner	Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	4.00-1	108	32x3	32x3	Wood	Ell	Left	Cent	Plain, 3	Roll	Roll	Roll	Studebaker, Four
Stud-Wagner	Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.70-1	121	34x4	34x4	Wood	Ell	Left	Cent	Plain, 4	Roll	Roll	Roll	Studebaker, Six
Stutz-Remy	Cone	Sel	Unit X	3	Bevel	Tor T	Float	130	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	B&R	Roll	Stutz, 4-E	
Stutz-Remy	Cone	Sel	Unit X	3	Bevel	Tor T	Float	120	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	B&R	Roll	Stutz, 4-E	
Stutz-Remy	Cone	Sel	Unit X	3	Bevel	Tor T	Float	130	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	B&R	Roll	Stutz, 6-E	
Stutz-Remy	Cone	Sel	Unit X	3	Bevel	Tor T	Float	120	34x4	34x4	Wood	Ell	Right	Right	Plain, 3	Ball	B&R	Roll	Stutz, 6-E	
Gray & Davis	Disk	Sel	Unit M	4	Bevel	Tor T	Float	3.50-1	134-24	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Roll	Ball	Roll	Touraine, 12
Undecided	Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.75-1	118	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Tribune, A
Bijur	Disk	Sel	Amid	4	Bevel	Tor T	Float	3.04-1	138	35x4	35x4	Wood	Cant	Left	Cent	Plain, 4	Ball	Ball	Ball	Vaughan, Six
Gray & Davis	Disk	Sel	Unit X	3	Bevel	Springs	Float	4.00-1	113	34x4	34x4	Wood	Ell	Left	Cent	Plain, 3	Ball	B&R	B&R	Velle, 5
Gray & Davis	Disk	Sel	Unit X	4	Bevel	Springs	Float	4.00-1	121	36x4	36x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Velle, 9
Gray & Davis	Disk	Sel	Unit X	4	Bevel	Springs	Float	4.00-1	126	37x4	37x4	Wood	Ell	Left	Cent	Plain, 3	Ball	Roll	Roll	Velle, 10
Gray & Davis Ex	Cone	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	105-15	32x3	32x3	Wood	Ell	Left	Cent	Plain, 2	Plain	Ball	Ball	Vulcan, 27
White-Entz	Cone	Sel	Amid	4	Bevel	Rad Rd	Float	110	34x4	34x4	Wood	Ell	Left	Cent	Ball, 2	Ball	Ball	Ball	White, GAF	
White-Entz	Cone	Sel	Amid	4	Bevel	Rad Rd	Float	120	36x4	36x4	Wood	Ell	Left	Cent	Ball, 2	Ball	Ball	Ball	White, GEB	
White-Entz	Cone	Sel	Amid	4	Bevel	Rad Rd	Float	132	37x5	37x5	Wood	Ell	Left	Cent	B&P, 3	Ball	Ball	Ball	White, GF	
U. S. L.	Cone	Sel	Amid	4	Worm	Rad Rd	Float	4.80-1	120	36x4	36x4	Wire	Cant	Left	Cent	Plain, 5	Roll	Roll	Roll	Willys-Knight, K-17
Gray & Davis	Disk	Sel	Amid	4	Bevel	Springs	Float	3.43-1	130	36x4	36x4	Wood	Ell	Left	Cent	Plain, 4	Ball	Roll	Roll	Winton, 20
Remy	Plan	Amid	Unit M	2	Chain	Rad Rd	Dead	4.50-1	80	30x3	30x3	Wood	Ell	Right	Pedal	Plain, 2	Plain	B&R	B&R	Zimmerman, D&E
Remy	Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	132	36x4	36x4	Wood	Ell	Opt	Cent	Plain, 4	Ball	Ball	Ball	Zimmerman, B-6

**ABBREVIATIONS:**—Clutch Type: Exp. Bd., expanding band; Con. Bd., contracting band. Gearset: Sel., selective; Prog., progressive; Plan., planetary; Fric., friction; Unit M, unit with the motor; Unit X, unit with the rear axle; Amid., amidships. Drive: Bevel, shaft with bevel gears in rear axle; Worm, shaft with worm gears in rear axle; Worm B, shaft with worm bevel gears in rear axle. Car Drives Through: Tor. T., torsion tube; Tor. R., torsion rod; Rad. Rd., radius rods; TTRR, torsion tube and radius rods. Rear Axle: Float, floating; Semi F., semi-floating; Float., three-quarter floating. Gear Ratio: \* two speed rear axle. Wheels: Opt., optional. Springs: Ell., elliptic; Ell., semi-elliptic; Ell., three-quarter elliptic; Plat., platform. Gearshift: Elec., electrically operated; Bearings: Roll, roller; B. & R., ball and roller; B. & P., ball and plain; B. R. & P., ball, roller and plain.

# The American Car for 1914

Tendency of Automobile Design for the Year Shown  
by a Review of the Whole Industry Taking Each  
Car Separately and Studying Its Principal Features



## TREND

¶ The six-cylinder car has come into its own this year. Around the \$2,000 mark may be secured cars of this class which rival in lightness the four. These cars uniformly are fitted with luxurious equipment and in all cases comfort, easy riding, flexibility and power have been made a study. The result has been a powerful, economical car.

¶ Electric lighting and cranking is another great development of the year. At this time last season many cars had this equipment added but it was done in such a hurried manner that more than 50 per cent. of the users have changed their methods of installation. The cranking motor this year together with the battery and generator are much improved products.

¶ Streamline bodies deserve to be well up toward first place in a consideration of the development which has taken place during the past year. Beauty is now a primary consideration in the design of the American body and although we have not quite caught up to Europe we are gaining rapidly.

ON these pages is set forth the story of the automobile year in this country. The brains of the American automobile engineer have produced an average car that stands out far above the car of last year in comfort, efficiency and appearance. This year has been a year of progress, left drive, central control, wire wheels, better bodies, better economy and a hundred other points can be mentioned among the changes made between the years of 1913 and 1914.

The small car deserves a special mention. These little vehicles which are marvels of economy and lightness are increasing rapidly in favor. They answer the question of the man or woman who desires a car which represents but a small first cost and which are but little expense in their maintenance. They are easy on tires and secure a wonderful mileage on little fuel.

## Abbott Adds a Six

In addition to continuing its two four-cylinder models, namely the 34-40 and 44-50 types, with practically no changes mechanically, a six-cylinder chassis has been added. This light six, Belle Isle model, is provided with a 3.75 by 5.25 Continental motor. It is equipped with Auto-Lite electric cranking and lighting, and Bosch magneto. The latter is a single system, independent of the other electric apparatus. The L-head motor is a unit with the gearbox. The suspension is at three points by the overhead method, one at the forward end and two at the rear. The lubrication is by Continental's latest oiling system, a circulating splash arrangement with a new type of pump.

The touring body is a seven-passenger with a wheelbase of 130 inches and a net weight of 3,620 pounds. The tool boxes are concealed back of the dust shield, giving a clean running board. The car has left drive and center control. Other features are a multiple dry disk clutch, the diameter of the plates of which has been increased over that of the fours, drive shaft provided with a universal joint at either end, floating rear axle mounted on Shaeffer annular and Timken roller bearings, four-speed gearset with direct drive on third and fourth, geared up 25 per cent. Unlike the fours, the new six has its springs mounted above the axles instead of being underslung. The 20-gallon gas tank is carried at the rear. Wheels have 35 by 4 1-2-inch tires. The specifications list full equipment.

On the new six chassis, a roadster body is also fitted, equipped with wire wheels as standard.

The fours are continued in the various body models. The 34-40 has a 4.125 by 5.25 motor and a wheelbase of 116 inches, and the 44-50 is equipped with a 4.5 by 5.5 power plant and its wheelbase measures 121 inches. On these fours, the cowl form of dash has replaced the straight type, while heavier rear springs have been necessitated to carry the extra spare rim which is mounted at the rear. Steering and control are on the right while multiple disk clutch and three-speed gearset are in unit with the engine. Tires are 34 by 4 all around on the 34-40, and 36 by 4.5 on the front and 36 by 4.5 on the rear of the 44-50 model.—Abbott Motor Co., Detroit, Mich.

## Allen a New Car for 1914

The four-cylinder Allen 40, one of the many new cars of 1914, is built on one chassis, with a wheelbase of 118 inches, to which is fitted either of two types of bodies, five-passenger touring or roadster, each selling for \$1,395.

One feature that individualizes the Allen is the gasoline tank in the shroud dash, a gauge on the instrument board showing the quantity of fuel in the tank. Electric starting and lighting sys-



tems have been installed and left drive and center control adopted as most feasible.

The cylinders of the unit power plant have a bore of 4.125 and a stroke of 5, giving an S. A. E. rating of 27.25 horsepower. The cylinders are cast in block. Timing gears are of the helical type and run in oil. The cooling system is thermo-syphon.

The motor is lubricated by a constant level splash system, the oil reservoir being in the lower half of the crankcase. A plunger pump, operated by an eccentric on the camshaft, furnishes oil to the timing gears and connecting rod troughs for splash to the pistons and crankshaft bearings.

Ignition, lighting and starting are separate systems and independent of one another. The lighting and starting is by Auto-Lite system, which consists of an engine-speed generator, storage battery and electric motor. Ignition is furnished by the Split-dorf dual magneto.

The clutch is a multiple disk, the driving disks are faced with Raybestos and the driven disks are of steel with ground faces. It can be run dry or in oil in delivering the drive to the three-speed gearset.

The Allen is upholstered with 10-inch cushions, the body nickel-trimmed throughout and the battery and lighting switches and all dash equipment made accessible to the driver by the arrangement of instrument board and cowl. The regular equipment includes Stewart speedometer, one-piece windshield, electric horn and extra demountable rims for 34 by 4 oversize tires.—Allen Motor Car Co., Fostoria, Ohio.

#### American Made in Four Chassis

Three sixes and a four will make up the American line for this year, the four-cylinder being the only model which is carried over from last year. On these four chassis five distinct models will be put out. These models are designated by number which includes the number of cylinders, the horsepower and the seating capacity. The 442 is a four-cylinder car, rated at 40 horsepower, seating two people and is the same car as has previously been known as the Scout. Beside this there are models 642, 644, 646 and 666, the latter a six-cylinder car of 60 horsepower, seating six people and known as the big six.

The power plant of the four, as well as the chassis, remains practically unchanged. The American tourist model which has been displaced by the 646 and 644 will no longer be made. The only changes in the four-cylinder model are in the matter of equipment. An air-cranking system has been added and an electric-lighting generator. Air pressure is provided by a reciprocating pump.

The two new sixes are the same in general design, they have T-head cylinders, cast in a single block but with separate exhaust ports for each cylinder. The exhaust ports are at an angle with the manifold and point backward at an angle of about 40 degrees. Splash lubrication is used for the cylinders, the remaining bearings being lubricated by splash.

Electric lighting and cranking is provided for by a base which is cast integrally with the crankcase. A new double-type Disco, a two-unit instrument, in a single housing is used. The generator is driven from the pumpshaft through a flexible coupling. The double upper water connection between the cylinders and radiator, a feature of American construction is continued.

Gasoline is feed by pressure through a hot-water jacketed Rayfield carbureter. Air pressure is maintained by a piston pump operated by cam on the rear end of the camshaft. Ignition current is furnished by an Eisemann dual magneto. An inverted cone clutch is used and a four-speed gearbox. The rear axle is floating. The regular equipment includes Ames shock-absorbers for the front springs and Truffault-Hartfords for the rear. Right-side control and steering are retained.—American Motors Co., Indianapolis, Ind.

#### Ames Shows Few Changes

Ames cars are continued unchanged for the new year. These appear as a single chassis model known as the 45. This has a

four-cylinder 4.125 by 5.25 motor, rated at 27.25 horsepower by the S. A. E. formula. The motor is a block casting of the L-head type with a combination splash and pressure lubrication maintained by a piston pump. A Gray & Davis starting and lighting system is supplied and in unit with the motor are the disk clutch and the three-speed gearset. A conventional shaft and bevel gear reduction transmits the power to the floating rear axle. The wheelbase is 118 inches and tires 36 by 4 inches. The driver's position is on the left side and the control levers are in the center.

Upon a single chassis are fitted two bodies, a five-passenger touring car and a roadster. The car lives up to its nick-name of the Kentucky Thoroughbred by its smooth lines, clean running board and general racy appearance.—Ames Motor Car Co., Owensboro, Ky.

#### Apperson Now Making a Six

Apperson cars make their formal entry into the six-cylinder ranks this year. Although a few sixes have been produced before this on special orders they have never been incorporated as a part of the regular production program. For the new season six different chassis models are offered, four of which are six-cylinder cars. The four-cylinder car is the 4-45 which is continued practically unchanged from last year when it was the smaller of the two four-cylinder motors marketed. Simultaneously with the entry into the six-cylinder field Apperson cars appear for the first time with left drive and center control. Also the three-quarter floating axle has been supplanted by the floating type throughout the range of models. The four-cylinder aside from these changes has been altered only by the lengthening of the wheelbase, 2 inches in the case of the roadster model and 6 inches in the case of the touring car model so that these are 116 and 120 inches respectively.

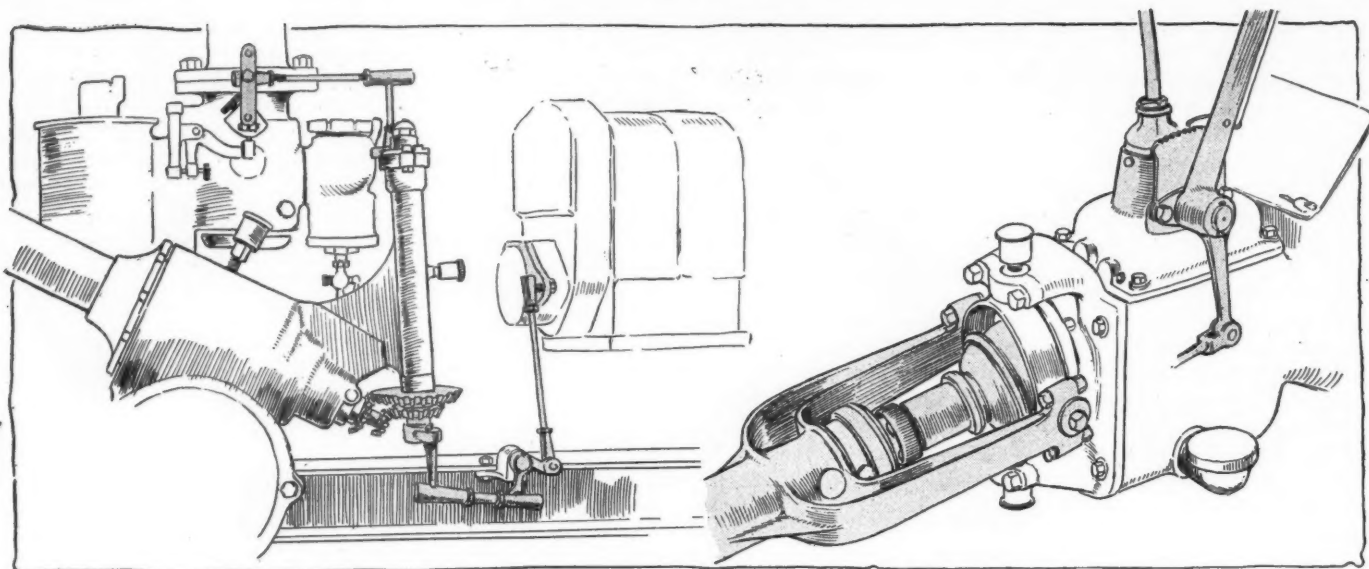
The four six-cylinder models mark the transition of the Apperson products from the separate T-head cylinders to the block-cast L-head cylinders. There are two motor sizes, one known as the 6-45 with 3.75 by 5.5-inch cylinders and the other 6-55 with 4.25 by 5-inch cylinders. Each of these has 120-inch wheelbase on the roadster chassis and 128-inch wheelbase on the touring chassis. Tires are 36 by 4 on the smaller six and 3 by 4 1-2 on the larger six. The four-cylinder car has 24 by 4-inch tires as a roadster and 36 by 4 as a tourist.—Apperson Bros.' Automobile Co., Kokomo, Ind.

#### Arbenz a Four-Cylinder Chassis

A four-cylinder chassis upon which a five-passenger touring, four-passenger torpedo and two-passenger roadster are mounted makes up the Arbenz line for 1914. The power plant is a 4.125 by 5.5 with L-head cylinders cast in pairs. The valves are all located on the left side and are operated by a helical gear driven camshaft. The transverse shaft carries the magneto and water pump. The crankshaft is carried on three main bearings bushed with bronze. A dual system of ignition is used and electric lighting and starting. A 15-gallon gasoline tank located under the dash cowl supplies fuel by gravity to a Schebler model L carbureter. The drive is taken by a leather faced cone clutch housed in the flywheel through a three-speed selective gearset carried in a unit with the rear axle to a bevel gear floating rear axle. The wheelbase is 120 inches. The tires are 36 by 4 all around and are fitted with demountable rims. The car is sold fully equipped.—Arbenz Car Co., Chillicothe, O.

#### Auburn Has a Four and a Six

Two chassis models which are new this season make up the Auburn line for 1914. One of these is a four and the other a six. The six is furnished with left or right drive. The six-cylinder power plant is a 3.75 by 5.25 having L-head cylinders cast in pairs. The valves are carried on the left side and are operated from a gear-driven camshaft carried on four plain bearings. The motor is lubricated by a constant level combination force feed and splash system by which oil is circulated by a



American throttle and spark linkage—Buick gearbox and universal joint, showing torque yoke

piston pump. Water circulation is by a centrifugal pump through a vertical tube radiator cooled by a fan. Ignition is Simms dual high tension. The gasoline system consists of a gravity feed gasoline tank which supplies the fuel to a model L Rayfield carburetor fitted with a hot air pipe. Starting and lighting is by the Remy electric system. A leather face cone clutch delivers the drive to a three speed gearbox and a floating rear axle of the bevel gear type. Drive is taken through radius rods. The wheelbase of this chassis is 130 inches and the tires 37 by 4.5 all around. On this chassis are mounted a five and six-passenger touring car and a two-passenger roadster.

The four-cylinder chassis differs materially from the six in general design. The 4.5 by 5 T-head motor is used carrying the intake valves on the right and the exhaust valves on the left. The camshaft is driven through helical gears. The gasoline system in this car is a pressure feed with the gasoline tank located under the front seat. The carburetor is a Schebler. The ignition system also differs from the six being a Remy dual using a Remy high-tension magneto with dry cells for starting. The Remy starting and lighting system is used on this car. Another difference in the four is that it has left drive and center control whereas the six has right drive and right control on the 6-45 and left drive and center control on the 6-46. A cone clutch is also used in this car but the friction surface instead of being leather is raybestos. A full line of body types including five and six-passenger touring, two-passenger roadster and three or four-passenger coupé is offered with this model.—Auburn Automobile Co., Auburn, Ind.

#### Austin Six Has New Motor

The Austin Automobile Co., Grand Rapids, Mich., has brought out a new edition of their Model "66," six-cylinder car which, though the same in general appearance and many of its chassis details as its predecessor, has a new motor, includes electric lighting and cranking as regular equipment, and incorporates the Austin two-speed axle as a standard feature.

The new power plant of the Austin 66 is of the T-head type with the cylinders cast in block. The bore is 4 1/2 inches and the stroke 6 inches, giving a stroke bore ratio of 1.333. This engine replaces a T-head which had its cylinders cast separate, and though of the same bore as that now used the stroke was 1/2 inch less, giving a ratio of 1.222. Thus, though rated the same according to the S. A. E. formula, the new engine has considerable advantage of the old in power output.

The former price of \$5,000 has been reduced to \$4,000.

The multiple disk clutch is carried in the flywheel and the transmission is amidships, supported by cross-members from the frame. The crankshaft and camshaft are mounted on four

bearings each; the motor has combination force and splash lubrication and the Westinghouse complete automatic system of electric starting, lighting and ignition.

Left drive and center control are features, and though the spark and throttle levers and the gearshift lever are conventional, the brake control is not. The service brake is connected with the clutch pedal, coming into play after the clutch has released. The other pedal operates the emergency brake, instead of having a lever alongside of the gearshift lever for this purpose. This lever's place is taken by the lever which shifts forward or back to operate the two-speed axle.

This two-speed construction affords two separate gear ratios on direct drive. The regular ratio is 3.5 to 1, while the special direct gives 2.33 to 1. Shifting of one to the other is done at will without interfering in any way with the gearing in the gearbox. Thus six forward and two reverse speeds are really afforded with this axle in combination with the three-speed gearset. The special advantage of this axle is that for hills and crowded city traffic the car is specially flexible of control by the use of the 3.5 to 1 ratio without the bother of continual gearshifting, while for normal driving it is instantly possible to gear up to 2.3 to 1, which means a material slowing down of the engine for a given car speed. This makes for less vibration, reduces noises to a minimum and is a factor for fuel economy.

The easy riding of the Austin has been further augmented on the new models by the use of a specially designed type of hydraulic shock absorbers. These are a patented Austin feature and of an entirely new design, it is said. The rear springs are underslung from the rear axle. Other features include an enclosed drive shaft fitted with a double universal joint at its front end, floating rear axle. The wheelbase of the car is 141.25 inches, and tires are 37 by 5 all around.—Austin Automobile Co., Grand Rapids, Mich.

#### Buick Has Three-Chassis Range

Cars on three chassis models are made by the Buick company this year. These consist of a small four, designated model B24 with roadster body and as B25 with touring body; a larger four, known as B36 in roadster dress, B37 as a touring car and B38 as a coupé; and a six called model B55 in touring car type only. This is the first year Buick has offered a six-cylinder machine, and together with the larger four, comprises a line which is a new series in Buick making. They incorporate the latest of body fashion as to streamline appearance, sloping hood and rounded top radiator, and have clean sides and running boards. The four-cylinder cars are practically a continuation of the smaller chassis models of last year, refined and improved throughout.



All models use the valve-in-the-head motor. The same design evidenced throughout, the only differences mechanically being in the size of the parts, although the engine of the smaller four departs from the others in design to the extent that its gearset is separate from the engine, whereas with the larger four and the six they are all bolted together. The square 4 by 4 engine used in last season's large four-cylinder has been dropped and in its place a 3.75 by 5 engine is used in the big four. The six-cylinder engine also has these cylinder dimensions, whereas the smaller four retains its 3.75 by 3.75 sizes.

Cylinders are cast in pairs and have integral heads. Both intake and exhaust valves open directly into the tops of the cylinders and the long valve rods are all on the right. One of the two mechanical changes of any note in the power plants is the use of new type of rocker arms and camshaft rods which now have ball joints working in oil-soaked, felt-lined sockets. This makes the valve mechanism noiseless since metal works against felt. The exhaust manifold, instead of passing along the cylinders below the intake manifold, runs above making the carbureter more accessible.

Electric cranking, lighting and ignition are incorporated in a combination Delco unit on all models as standard equipment, while left drive and center control replace right drive and control throughout the line. Instead of employing a sub-reservoir in the bottom of the crankcase as heretofore, the engines are now lubricated by a constant-level splash system, the lubricant being circulated by a gear-driven pump.

The Buicks have cone clutches and three-speed gearsets. The propeller shafts are enclosed within torsion tubes and in this construction only one universal joint is fitted, this being at the front end. The axles of the fours are now of the three-quarter floating type. The six has a floating axle.

The gasoline tank on the larger four and on the six is placed at the rear of the chassis and the fuel is fed to the carbureter by pressure. The small four retains its fuel tank under the front seat, feeding by gravity.

The wheelbase of the small four-cylinder model remains at 105 inches, while that of the larger four-cylinder car is 112 inches, or 4 inches longer than that of the four-cylinder machine of last year which it replaces. For the six, 130 inches is used. The price of this new six is \$1,985, fully equipped; of the larger four, \$1,335 and of the smaller four, \$1,050. These are touring car prices, the roadsters which are furnished on either of the four-cylinder chassis listing at \$100 less in each case. The coupé is sold for \$1,800.—Buick Motor Co., Flint, Mich.

### Cadillac Has Two-Speed Axle

The policy of building a single chassis model with a four-cylinder power plant is still adhered to by the Cadillac Company.

The biggest change in the new model is the adoption of a two-speed, direct-drive rear axle to replace the conventional single type. Instead of having one bevel driving pinion connected

with the propeller shaft and a single bevel driven gear as in the ordinary construction, the Cadillac now is fitted with two bevel pinions and two bevel gears thrown into mesh by electro-magnets. This affords two different gear ratios, each driving direct from the engine to the axle without intermediate gearing when in high. The low gearing gives a ratio of 3.66 to 1 and the high 2.5 to 1.

This new axle feature does not affect the other gearing in any way, that is, with either set of axle gears operating, the shifting of gears from first to second to third or to reverse in the gearbox is the same as though the ordinary axle were used. Thus this two-speed axle makes possible six different speeds forward and two reverse.

The new Cadillac also has special provision for easy access to the driver's seat from the drive side of the car. This is made possible through the hinging of one of the arms of the steering wheel so that the wheel will drop into a vertical position. The arm opposite is made in U-shape to go around the steering column, while there are two latches at the top of the column which engage notches near the center of the spider and hold the wheel rigidly in normal position for driving. Besides making the doors wider, the entrance from the drive side is further facilitated by the hinging of the driver's seat so that it will swing up out of the way.

The combination Delco cranking, lighting and ignition system is retained on the 1914 cars, though several detail refinements have been made. A double system ignition employing two sets of spark-plugs has been replaced by a dual system using one set of plugs. This simplifies the wiring to a large extent. The electric heating for easy starting is applied to the carbureter.

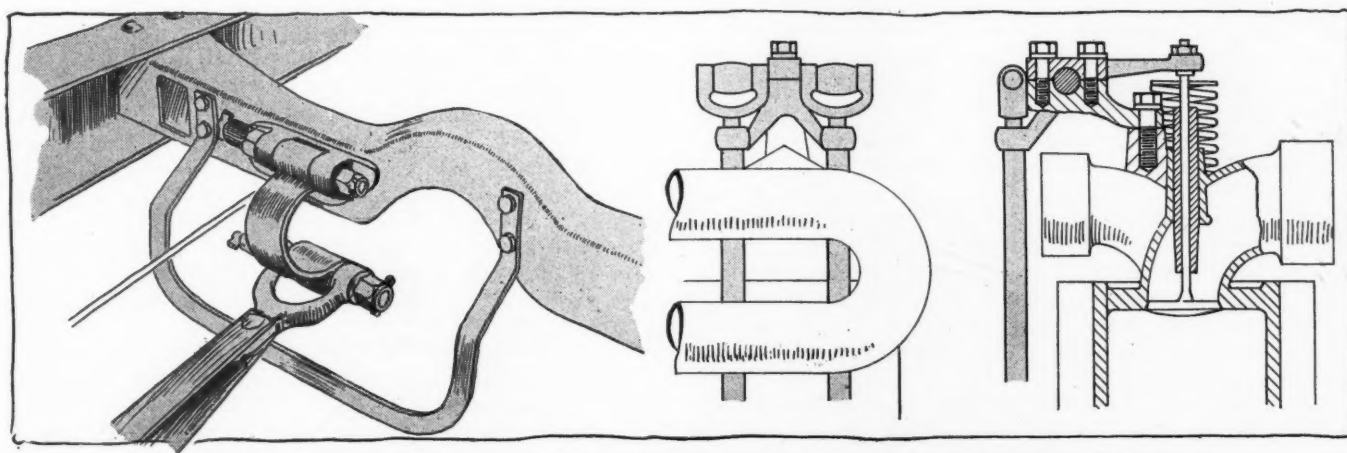
This year the gasoline tank is placed at the rear of the chassis and below the frame, the fuel being fed to the carbureter by pressure. This replaces the gravity feed method with the tank under the seat as formerly used. The tank holds 20 gallons.

The well-known Cadillac motor has singly-cast L-head, removable cylinders. These heads carry the valve chambers and pockets. The cylinders are 4.5 inches in diameter and the stroke is 5.75 inches, giving a ratio of 1.28. The cylinders are copper water-jacketed—a characteristic Cadillac feature.

The crankshaft is carried on five bearings, the camshaft on three. The motor suspension is by means of two arched cross members from the center of which the motor is hung, front and rear. An automatic splash system oils the motor.

The cone clutch retains its special spring ring in the flywheel, making for easy engagement, while back of it is the three-speed gearbox. A special feature of the front axle is the concealment of the speedometer driving gears within the left wheel spindle. The wheelbase is retained at 120 inches.

Seven body styles are offered, these being a five-passenger touring car, seven-passenger touring car, four-passenger phaeton, roadster, landaulet-coupé for three, five- and seven-passenger limousines.



Chalmers torque rod connection, Franklin improved overhead valve mechanism adopted this year

Besides the usual equipment, the new Cadillacs have a power driven tire pump and an electric horn under the hood.—Cadillac Motor Car Co., Detroit, Mich.

### Cameron Making New Water-Cooled Car

Cameron has a new car for this season which besides water-cooling, embodies many features new to Cameron policy. The chassis incorporates a four-cylinder block motor having a bore of 3.625 inches and a stroke of 5 inches. The valves are located in the centers of the combustion chambers and placed directly over the pistons, being operated by inclosed rocker arms from a single camshaft. The motor has a particularly compact appearance for a valve-in-the-head design as it is fully inclosed with all its working parts running in oil, the aim being to secure the high power of the overhead valve action without its noise. The ignition current is furnished by a high-tension magneto and the circulating oiling scheme is operated by a pump contained in the crankcase. A distinctive feature in the cooling system is the pointed radiator which tends to give the car a long racy appearance. The gasoline system is a gravity feed, the tank having a capacity of 18 gallons and being carried in the cowl on all except the raceabout model in which it is mounted behind the rear seat. This is a speed car of low lines and wire wheels.

The clutch is an inverted cone transmitting power to a four-speed and reverse gearset furnishing direct drive on all speeds. This gearset is a distinctive feature of Cameron design and is remarkable for the fact that in securing the four forward speeds and one reverse, but eight gears and eight bearings are required in the complete gearbox and rear axle which are mounted as a unit. This of course, includes the differential. Elliptic springs with scroll ends are used in the rear and the wheels are 32 inches all around, equipped with 32 by 3.5 inch tires. Both brakes operate on the rear wheels, the emergency brake being controlled by a lever in the center of the car as the steering is mounted on the left side. A dark blue finish is standard on the Cameron cars, the weight is 1,975 pounds, wheelbase 115 inches and the price \$1,200 including lighting and starting by electricity.—Cameron Mfg. Co., West Haven, Conn.

### Carter Has Two New Cars

Though not favoring the annual model idea, the Cartercar company has recently added to its line of open and closed cars fitted to model 5 chassis, a roadster and touring car mounted on an entirely new chassis, known as model 7. This has been added to meet the demand for a cheaper car than the model 5. In it, the standard Cartercar type of friction drive is incorporated, but a number of modifications of the larger design have been included in order to make a less expensive and lighter job.

The new model 7 sells for \$1,250 and is equipped with a 3.5 by 5-inch three-point suspended engine. The four cylinders are block cast and have a detachable head. The lubrication is by splash, water cooling with a centrifugal pump is used and a dual ignition system which is a part of the electrical combination furnishing lighting and cranking as well, is employed. This electric apparatus is standard.

The transmission is of the Cartercar patent friction type and the final drive is through a silent chain running in oil. The rear axle is three-quarter floating and the car has a wheelbase of 106 inches. Demountable rims carry 32 by 3 1-2 inch tires. Roadster and touring bodies may be had on the model 7 chassis.

The model 5 car which sells for \$1,700 as a touring car and \$100 less as a roadster is also fitted with a four-cylinder motor of the L-head type with valves on the left. The cylinders are in pairs, have a bore of 4 1-8 inches and the stroke is 4 3-4 inches. The motor also has three-point support. Splash lubrication and centrifugal pump water circulation are used, as is a low tension magneto ignition system. Light and cranking by electricity are also featured.

Back of the engine there is the same type of friction and final drive as mentioned above. This car has its gasoline tank under the cowl, the fillers protruding conveniently through the

cowl, also a visible gasoline gauge. The wheelbase of this model is 116 inches as heretofore and tires are retained at 36 by 4 inches all around.

Besides the open bodies, the model 5 is fitted with a distinctive design of coupé and also a sedan. The former is listed at \$1,900 and the latter at \$2,000. These are most attractive in design, being along the colonial lines. Right hand steer is used.—Cartercar Co., Pontiac, Mich.

### Case Building Two New Cars

For 1914 the Case Co. has discontinued the model 30, is building two new fours, the 25 and 35, and will carry over but one 1913 model, the 40. The feature of the entire Case line is the equipment. This includes the Westinghouse two-unit cranking and lighting system, Warner autometer, clock, electric horn, extra tire on a rim, two extra inner-tubes, spark-plug pump on the 40. Weed tire chains, windshield, and work light. The new 25 is a 110-inch wheelbase car selling at \$1,250. The motor is of four cylinders of 3.75 bore and 4.75 stroke of T-head construction. A disk clutch, three-speed selective gearset and semi-floating rear axle are used. Bosch duplex ignition and a Rayfield carburetor are part of the motor equipment. The 35 is slightly larger in size, having a 120-inch wheelbase, but in general design it is the same. The motor is of four cylinders with a bore and stroke of 4.25 by 5.5. This motor uses Bosch dual ignition. The Case 40, which is carried over from 1913, has had the price increased from \$2,250 to \$2,300, Bosch dual ignition supplanted by two-point of the same make, and the air pump for the pressure, gasoline feed changed from the left to the right side. The 40 has a 124-inch wheelbase and 37 by 4 1-2 inch tires. In general appearance and construction it is similar to the rest of the line. All Case cars will be made with the instruments on a cowl board.—J. I. Case T. M. Co., Racine, Wis.

### Chadwick Markets a Single Chassis

A six-cylinder, chain-drive chassis with four types of body consisting of a roadster, touring, tournabout and limousine will compose the Chadwick line for 1914. The car is equipped with a Westinghouse electric lighting and starting system and weighs about 3,000 pounds without the body. The motor has its cylinders cast in pairs, each pair being surrounded by a copper water-jacket. The shape of the cylinder casting is L-head and the intake valve is carried in the head and the exhaust valves are located on the left. The two camshafts are driven by helical gears. The ignition system is divided into two independent parts giving a two-double system. For running current the Bosch D R 6 magneto is used with hand control operating a spiral sleeve which rotates the armature shaft giving a hot spark with the magneto at low speeds. For starting current the battery is employed, or the car can be started on the magneto owing to the spiral sleeve control. The electric starter is the Westinghouse single wire system, which is combined with the lighting equipment. The entire system operates at 6 volts. The power is taken from the motor by an expanding band type of clutch faced with leather, the leather friction surface bears against the cast iron flywheel and takes the drive back to a four-speed gearbox mounted amidships. The control of the gearset is semi-selective with the shifting lever mounted on the right side. The power is transmitted by double chains, enclosed in grease-tight aluminum chain cases, to the wheels which run on dead rear axle. Fourth speed is direct and has a total reduction of 2.25 to 1. Third speed which is semi-direct has a 3 to 1 reduction. The drive is taken through radius rods. The wheelbase of the car is 112 inches for the roadster and 133 inches for the others and the tread 56.5 inches.—Chadwick Engineering Works, Pottstown, Pa.

### Chalmers Sells Two New Sixes

Chalmers has two representatives this year—the model 24 "Six-60" and the model 26 "Six-48."

Though the Chalmers Company had a six last year, the Six-60 is not a continuation of it. The new six has a T-head motor.



which type of power plant is entirely new to Chalmers construction; a casting with the intake valve in the head being characteristic of Chalmers motors heretofore. Compared with last year's six, the new model 24 has a slightly smaller motor, a wheelbase 2 inches longer—132 inches—and lists at \$2,175 in roadster and four- and five-passenger touring designs, which is \$225 under the figures on the six of last year in similar body types.

The cylinders of this new six are cast in threes with the exhaust valves on the right and the intakes on the left. With cylinder dimensions of 4 by 5.5 inches the motor has an S. A. E. rating of 38.4 horsepower. The six of last year had a bore of 4 1-4 and a stroke of 5 1-4 inches, hence it is seen that the new motor has a still stronger inclination to the long-stroke design. and this along with slightly less bore gives a very economical power producer. The gearset is in unit with the motor.

The crankshaft is mounted on three bearings, and a new feature is the use of tungsten steel valves which are said to be proof against pitting. The motor has a new oiling system of the force-feed type. The overflow from the crankshaft bearings instead of dropping into the oil sump is led out of the opposite end of the bearing from which it enters through a short pipe and drops into trays integral with the side of the crankcase and from these it flows into the connecting rod troughs, later finding its way to the sump.

The new Chalmers-Entz combined electric cranking and lighting system supersedes the air starting system on the 1913 model; single Bosch ignition takes the place of the previous dual type. The combined motor-generator has a novel position, being located under the right front seat and driven by a short propeller shaft, extending forward to the flywheel where it carries a sprocket driven by silent chain from another sprocket on the flywheel.

Besides the improvements over the former six which have already been delineated, the model 24 is provided with cork inserts in one set of disks of the multiple-disk clutch; there is a new torsion rod design which makes use of a curved leaf steel spring at the front end instead of a spring buffer; rear springs are underslung; for the first time in a Chalmers model, left drive and center control are used; the gasoline tank has been placed at the rear for the first time on a Chalmers.

Six body styles are made to be fitted to the model 24 chassis. These are streamline designs and in the open models the hood is heightened and widened as it converges into the cowl. No side lights are fitted. Besides full standard equipment, wire wheels and tire pump are optional extras. Tires are 36 by 4 1-2 all around.

The Six-48 is designed to answer the demand for a lighter weight six-cylinder car. This latest of Chalmers sixes has, like its larger brother, a six-cylinder T-head motor, and marks an even stronger tendency than previous Chalmers sixes to the long stroke design. The bore is 3.5 inches and the stroke 5.5 inches.

The wheelbase is 126 inches, and the chassis is equipped with 34 by 4-inch tires, instead of 36 by 4.5-inch as on the larger six. The clutch is the multiple disk cork insert type, like the big six and a three-speed transmission is used.

In every essential detail of construction the little six is similar to the big six-60. Lubrication is by the combination force-feed and splash system. The Chalmers-Entz electric starter, with generator and battery beneath the front seat, is used in the lighter model and Rayfield carbureter, with dash adjustment, is regular equipment. Atwater-Kent ignition, is also a departure.

In the six-48 the fuel is carried in a tank beneath the cowl of the dash. As in the case of the larger Chalmers six, the new six-48 has a streamline body. Doors are fitted without moldings and with invisible hinges. Tires are carried at the rear, giving clean running boards. Left drive and center control, permitting of entrance from either side, are also found on the new model.

In addition to the touring car, the six-48 is provided in a 2-

passenger Coupelet. This is a combination enclosed and open car type. With top raised it has the appearance and affords the protection of a regular coupé body; for summer driving the top may be folded down and the door glasses lowered, giving a strictly open roadster body.—Chalmers Motor Co., Detroit, Mich.

### Chandler Made in Six Cylinders

Chandler cars were not exhibited at the last shows, for the reason that at that time the Chandler Motor Car Co. had just been organized and only had an experimental car on the road. Since then the company has established a factory at Cleveland, O., and at the present time is turning out 200 cars a month.

The makers anticipated the demand for a lightweight six at a moderate price and in consequence of their foresightedness they are offering one that weighs less than 3,000 pounds fully equipped, selling for \$1,785 and with fuel economy one of its strong points.

The company manufactures its own motor from its own design, it being of the L-head type with the cylinders cast in two blocks, the valves inclosed, and the camshaft and cams cut from solid forgings. The crankshaft bearings are 1.875-inch in diameter, more than one-half of the diameter of the pistons themselves. Attention is called to the fact that the cast aluminum crank base extends to the frame sides, thus securing rigidity of engine mounting as well as protecting the motor from mud. This motor base also serves as an accessible mounting for the magneto, pump, electric horn, starting switch, and other accessories. The three-speed gearset is inclosed in a unit case with a multiple disk clutch, this unit being bolted directly to the engine base.

The oiling system is contained within the motor, with a rotary pump installed in the large oil reservoir of the engine pan, oil being pumped directly to all main bearings and all working parts. An individual trough system under each connecting rod provides splash lubrication for rods and pistons.

Other features of the Chandler are cooling by centrifugal pump floating pressed steel rear axle, double expanding type brakes, 34 by 4 wheels. In the way of bodies the Chandler follows the streamline idea with 10-inch Turkish upholstery, windshield built in without braces and adjustable for rain or ventilation. There are five styles of bodies, a five-passenger that lists at \$1,785, a roadster that lists at the same figures, the three-passenger coupe at \$2,485, a five-passenger limousine at \$2,985, and a five-passenger sedan at \$2,885.—Chandler Motor Car Co., Cleveland, O.

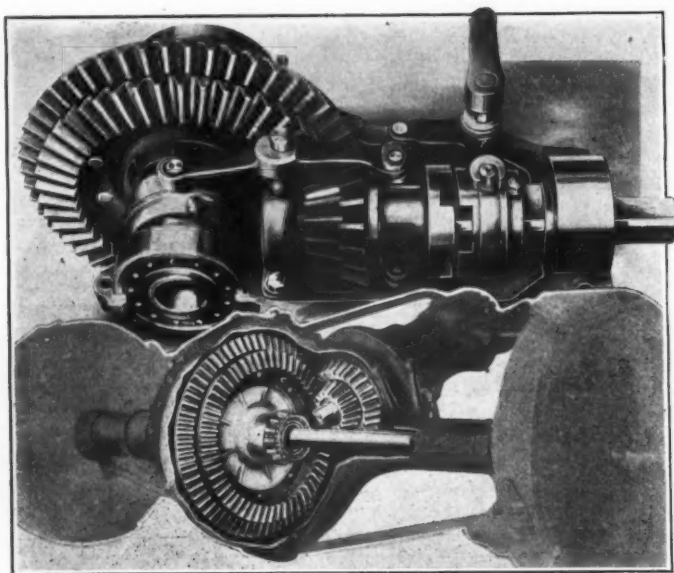
### Chevrolet Making a Cheap Six

A new light six-cylinder model to sell at \$1,475 is something the Chevrolet Motor Co., Flint, Mich., kept up its sleeve until show time. This new six fills out a line that also includes two fours, the Baby Grand which sells at \$875 and the Royal Mail roadster, which lists at \$750.

The six is a touring car, the motor being of the L type and with cylinders 3.3125 by 5.25. The valves are inclosed and the gearset is placed on the rear axle. The car has a 112-inch wheelbase and carries 34 by 4-inch tires. Such equipment features as electric lights and a self-starter, mohair top, curtains and boot and clear-vision windshield are included. The self-starter is an Auto-Lite.

The four-cylinder motor used on both the Baby Grand and the Royal Mail, as a valve-in-the-head and with cylinders 3.6875 by 4-inch. The cylinders are cast in block and have detachable heads. Also the valves are inclosed. The oiling system is splash, with positive pump and the sight-feed on the dash. The ignition is high-tension, the clutch of the leatherfaced cone type, the cooling thermosyphon, while left drive and center control are other features.

On the Baby Grand, which is a touring car, the tires are 32 by 3.5 and there is a 16-gallon gasoline tank, which is carried in the rear. The wheelbase is 104 inches and the weight of the car, equipped and carrying gasoline, oil and water, is given at 2,200 pounds. Electric lights with generator and an electric



Austin, above, and Cadillac, below, two speed axles

starter are quoted as extras at an additional cost of \$125. When this electric equipment is used a coil and distributor are used in the ignition system instead of a magneto.

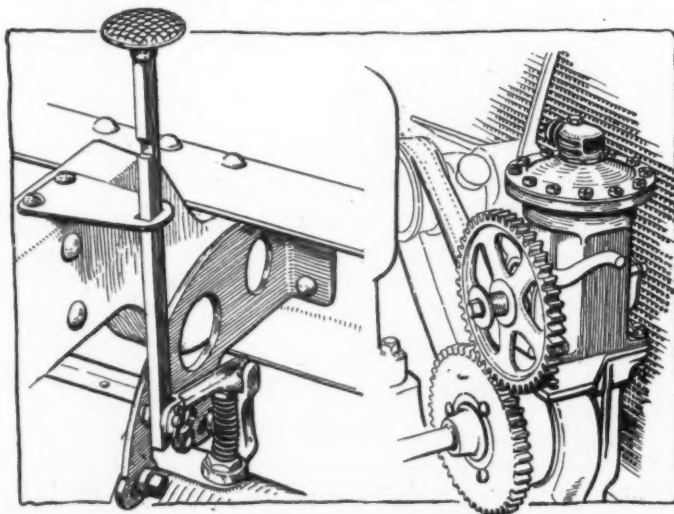
The main points of difference between the Baby Grand and the Royal Mail consist of smaller tires, 30 by 3.5, on the latter a larger gasoline tank, one carrying 20 gallons, while the weight is reduced to 1,975 pounds.—Chevrolet Motor Co., Flint, Mich.

#### Coeys Adds a New Four

A new four cylinder car has been added to the Coey line for 1914, the offering of the Coey-Mitchell Company now consisting of two cars, a four and a six, the latter appearing this year with no changes. The feature of the new four is the price, which is \$995 in five passenger touring form. This car has a short stroke motor of 5.5 by 5.25 inches with T head cylinders cast in pairs. The motor is thermo syphon cooled. Another feature of this car is the rear axle gearset, the drive to it being through a disk clutch and from it to a semi-floating rear axle. The wheelbase is 128 inches and the drive right and control center.—Coey-Mitchell Automobile Co., Chicago, Ill.

#### Cole Offers Two New Chassis

The 1913 three-chassis line of Cole cars has been dropped for the 1914 season and two entirely new left-drive cars offered, a four and a six-cylinder model of streamline design. They have concealed hinges and inside door handles; the running boards are



Cole cutout pedal and pump drive

also clean, this being obtained by placing the tools under the front seat and the battery under the floor boards. The tires are carried in the rear of the chassis.

The four has a 120-inch wheelbase and the six a 136-inch wheelbase and the power plant, clutch and gearset arrangements the same in both models. The bore and stroke of both motors is 4.25 by 5.25 inches, the cylinders L-head cast in pairs, and have water-jacketed intake manifolds. A motor-driven air pump gives the required pressure for the fuel which is fed to a Stromberg carburetor.

The Delco motor-generator and a battery comprise the dual ignition system. On the four cylinder car the motor-generator is driven by helical gears while on the six a silent chain is used. Splash pressure oiling is used and water circulation by centrifugal pump. The Delco improved 6-volt cranking, lighting and ignition system has been adopted on Cole cars for 1914.

The drive from the motor is taken by a cone clutch operating on ball bearings. This clutch is equipped with a brake to prevent clutch spinning and thus make speed changing noiseless and easy. In unit with the motor is the three-speed selective gearset the feature of which is that the shifter shaft is serrated. A 4 to 1 motor to rear axle ratio is used.

The drive shaft is equipped with two Spicer universals and operates a Timken floating rear axle. The instrument board which carries the lighting, cranking and ignition switches, hand air pump for gaining initial tank pressure, sight feed clock, speedometer, etc., is located at the rear of the shroud so that the instruments are within easy reach of the driver.—Cole Motor Car Co., Indianapolis, Ind

#### Colby Selling a Six

For this season the Colby company is confining its efforts to a six-cylinder chassis known as 6-C-60. This is made in either a seven-passenger or two-passenger roadster. The car has right drive and right control. The power plant is a unit supported at three points, including the motor, clutch and gearset. The 4.125 by 5.25 motor has its L-head cylinders cast in pairs with the manifolds as separate castings.

The valves are all on the left side and are operated by a camshaft driven through helical gears. The motor is lubricated by splash, the oil being circulated by a plunger pump and maintained at a constant level. Water is circulated through a honeycomb radiator by a gear pump. Double ignition system is used, the source of current being an Eisemann high-tension magneto. Fuel system includes a Rayfield carburetor which is fed by pressure from a 23-gallon tank located beneath the chassis at the rear end. This tank has a reserve feature holding 7 gallons. Lighting and starting is by the Gray & Davis electric system working in co-operation with a Willard storage battery through the single wire system at 6 volts.

The chassis running gear includes a disk clutch of which the friction surfaces are steel against raybestos delivering the drive to a three-speed selective gearset housed in the same casing that holds the clutch. Shaft drive transmits power to a bevel gear floating rear axle. The wheelbase is 136 inches, the tires 37 by 5 all around fitted with demountable rims. An extra demountable rim is supplied and shock absorbers are fitted as standard equipment.—Colby Motor Co., Mason City, Ia.

#### Continental Makes Two Fours

Two four-cylinder chassis known as model 27 and 30 will be the Continental output for this season. Model 27 is a hold over from last year while 30 is new throughout. The new model is more in the long stroke class than the previous Continental design, having a 3.5 by 5 inch power plant as compared to a 4.5 by 4.5 engine in the model 27. The new car is made in a five-passenger torpedo and a two-passenger torpedo roadster body. The L-head cylinders are cast in a block and the intake manifold is a unit with the cylinders. The exhaust manifold is cast separately. A unit power plant is formed by having an extension of the crankcase include the clutch and gearset. The



motor is cooled by thermo-syphon system and a vertical tube radiator. Ignition is by the same battery that is used in connection with the Westinghouse or Jesco electric lighting and starting system. The advance of the spark is controlled by a governor, thus giving a single automatic ignition. A dry disk clutch transmits the power to a three-speed selective gearset and a bevel gear floating rear axle. Propulsion is taken through the lower section of the three quarter elliptic rear springs. Left drive and center control is used on this car. It has a 110-inch wheelbase and 32 by 3.5 tires.

The hold-over model 27 is a little changed from last year, as far as general design is concerned. Right drive and center control is used.—Martindale & Milliken, Franklin, Ind.

### Corbitt Abandons Magneto Ignition

Corbitt cars are changed but very slightly from last year's construction. In the new cars the magneto has been abandoned and the Atwater-Kent type K distributor and coil substituted. These are built for automatic spark advance and are provided with connections for two sets of batteries. The steering arrangement is of the worm and gear type with friction control throttle levers above the wheel and the wheel has a corrugated rim with the arms of the spider inserted.

This construction differs from that of last year in that the throttle levers did not have any quadrant at all, a ratchet device in the steering head keeping the levers from changing their position. A double jet instead of a single jet carbureter now is employed. The new torque construction has a ball and socket cushion on the front end while the earlier type was fastened rigidly to the cross member of the frame. An additional brace at the rear end of the motor has been provided which still allows free action of the three-point suspension but at the same time holds the motor rigidly and prevents it from vibrating under load.

The motor is a four-cylinder 4 by 4.5 of the L-head type cast in pairs. Helical timing gears, pump water circulation and a combination splash-pressure oiling maintained by gear pump are retained. The North-East electric lighting and cranking system is fitted as stock, the disk clutch and three-speed gearset forming a unit power plant which is suspended at three points. The axle is of the floating type. The wheelbase is 120 inches and tires 34 by 4 inches in size. Right drive with center control is supplied.—Corbitt Automobile Co., Henderson, N. C.

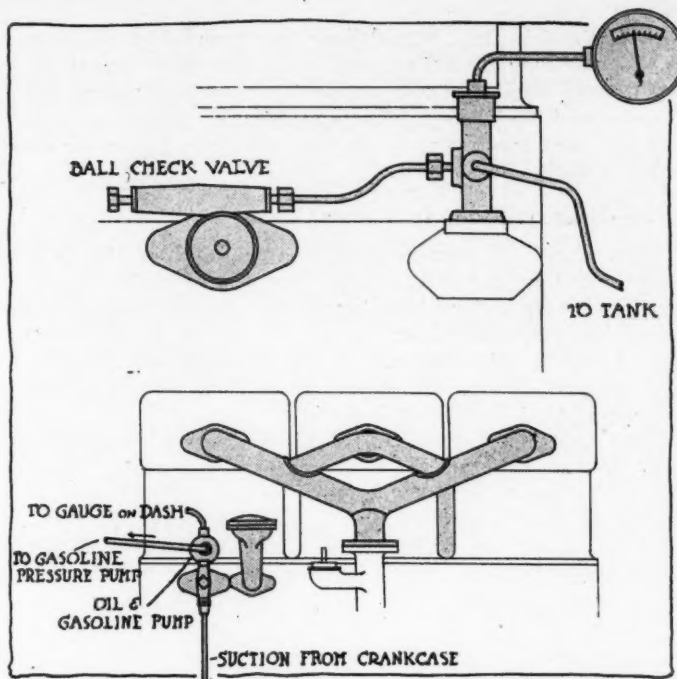
### Correja Markets a Six

The Correja car for this year will be a six-cylinder, 50-horsepower, with the cylinders cast in block. The motor is a 3.75 by 5.5 and has the valves all on the right side. They are operated from a camshaft driven by helical gears. An external longitudinal shaft running along the left side of the motor operates the water pump and magneto.

The motor is cooled by water pumped through the jackets and through a honeycomb radiator by centrifugal pump. The Zenith carbureter is used in connection with a pressure feed gasoline system, the fuel being fed under 2.5 pounds of air from a tank of 18 gallons capacity, located under the rear end of the chassis. As an aid to carburetion, a hot-air pipe is fitted to the carbureter.

The electric equipment of the car consists of a Ward-Leonard electric lighting and starting system, in connection with a Willard storage battery and a Simms high-tension S U 6 magneto, fitted with hand control. The magneto furnishes the sole source of ignition current. The starting and lighting system operates at 6-volts.

The clutch is a leather faced cone contained in the flywheel and the gearset a selective sliding one mounted as a unit with the rear axle. The gearset provides three speeds, and has a ratio of 3.5 to 1 on high, which is direct. The rear axle has a bevel drive, and the shaft is inclosed in a torsion tube. The wheelbase of this car is 128 inches and the tread 56 inches. Thirty-four by four inch tires are used all around, with demountable wooden wheels having clincher rims. The springs are all overslung. The

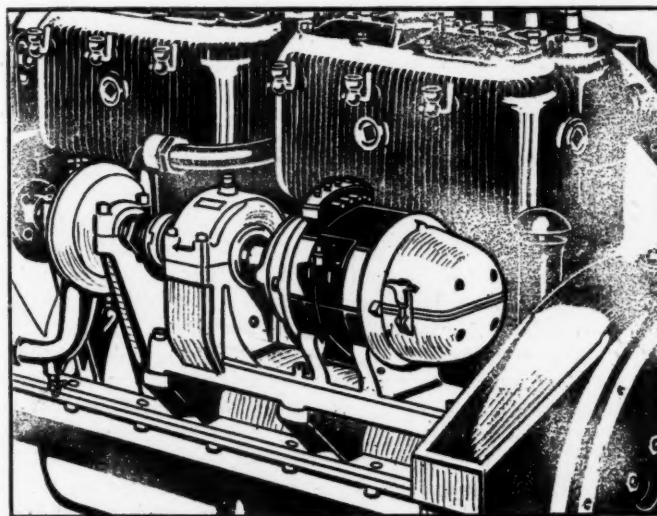


Flat oil pressure arrangement, Haynes oil and gasoline pressure

chassis weight, with gasoline, water, and oil, is 2,800 pounds.—Vandewater & Co., Elizabeth, N. J.

### Crane Marketing a New Six

Selling for \$8,300 without a body, the Crane chassis is in a price class by itself. The six-cylinder power plant has its 4.375 by 6.25 cylinders cast in threes. They are L-head and have their valves on the left side. The valves are operated by silent chain-driven crankshaft. The crankshaft is carried on three bearings, one at each end of the crankcase and the other between the two blocks of three cylinders; these are plain bearings. The camshaft is also carried on three plain bearings. The electric equipment includes a Rushmore starting and lighting system and Bosch dual ignition. The entire electric system operates at 6-volts and is a single wire type. The motor is lubricated by force feed, the oil being delivered under pressure to the main bearings and connecting-rods. The motor is cooled by a centrifugal pump and a honeycomb radiator. The clutch is a single disk in oil having a multibestos face against steel. It is housed within the flywheel in an extension of the crankcase which also includes the gearbox. The gearset provides four-speeds forward and



Method of driving generator on Haers motor

delivers the drive to a floating rear axle from which the drive is taken through the rear spring. The emergency brakes are on the rear wheels and the surface brake on the transmission just back of the gearset. The wheelbase is 136.5 inches, the tread 56.5 and the tires 36 by 4.5 front and 37 by 5 rear.—Crane Motor Car Co., Bayonne, N. J.

#### Crow-Elkhart Made in Three Chassis

Three chassis and ten body styles are offered by the Crow Motor Car Company, Elkhart, Ind., the line consisting of two fours and a six. There have been a few changes made in the mechanical construction, the 1914 cars coming through with heavier frames and in the case of the 40 horsepower car, cylinders are now cast in pairs instead of in block, and in the six cylinder in block instead of in pairs.

Flush lights instead of the bullet have been adopted, oversized tires are used and the windshield is now mounted on the cowl. The small four is 4 by 5 inches, the cylinders are L-head, cast in pairs, and thermosyphon cooled. The unit power plant is complete with a disk clutch. A feature of Crow-Elkhart construction this year is the rear axle gearset. The little four has a semi-floating rear axle, 114-inch wheelbase and 33 by 4-inch tires. Two body styles are mounted, a roadster known as the D 42 and a five passenger touring known as the D 45. The larger four-cylinder car differs only slightly from the one previously mentioned. The bore and stroke is 4.25 by 5.5 inches and the cylinders cast in block. It differs from the small four in the rear axle which is three-quarter floating; the wheelbase is 120 inches and the tire size, 34 by 4. This car is equipped with four body styles, a roadster and three touring cars, the former seating two, and the touring cars four, five and six. The new six is identical in construction with the larger four with the exception of the rear axle which in this case is floating. The wheelbase is 130 inches and the tire size 36 by 4. This car also appears with four body styles, as the large four.—Crow Motor Car Co., Elkhart, Ind.

#### Croxton Makes Four-Passenger Model

The Croxton is making a left drive and center control chassis fitted with a four-cylinder power plant and a four-passenger body. The motor is a 4.125 by 5.5 with its L-head cylinders cast in a block. The camshaft is driven through helical gears and is carried on three plain bearings. The motor is cooled by thermosyphon system, vertical tube radiator and a fan formed by the pitched blades of the flywheel. A Mea high-tension dual ignition is used and the carburetor is a Planhard fed by gravity from the tank of 22-gallon capacity located under the cowl. Electric lighting is supplied by the Northeast working at 6 volts. The clutch is a Raybestos and steel disk design, housed amidships with the gearbox, furnishing through the gearset three-speeds forward. The rear axle is floating, the wheelbase 121 inches and the tread 56. The car is sold with full equipment and either wood or wire wheels are provided, the front wheels being carried on roller bearings.—Croxton Motor Car Co., Washington, Pa.

#### Cunningham Incorporates Left Drive

Cunningham model M is the successor to model J, but there have been only few changes in the newcomer. Instead of right drive, as in J, model M drives from the left, and also has a single unit-starting and lighting system. Center control is used and both axles have been strengthened. The roller-bearing knuckle-head is used in place of the plain bearing.

In all other respects M is the same as J. The cylinder on the four-cylinder motor sizes are the same as before, 4.75 by 5.75, and the motor again is of the valve-in-the-head type. As showing how the company could peer into the future, it might be stated that model J, brought out a year ago, had the fuel tank in the rear, using pressure feed, while the spare tires also are carried in the rear. These same features are retained in model M.

Body lines in the Cunningham are, as usual, abreast of the times, the offerings consisting of a runabout, touring car, lim-

ousine, landaulet and berline, the last three being of seven-passenger capacity.—Jas. Cunningham Son & Co., Rochester, N. Y.

#### Davis Adds a Four and Six

Two new chassis, a four and a six and a carried-over four, slightly improved, is the offering of the Davis Company. The continued model known as the 50-A is identical with the previous offering, except that a new type of radiator and hood are used, and the body equipped with a cowl board instead of the conventional dash. The tires are increased to 37 by 4.5 inches from 36 by 4. The new four appears in two body styles, the two-passenger roadster, listed at \$1,335, and the five-passenger touring, offered at the same price. The motor dimensions are 3.5 by 5, the cylinders of L-head construction cast in block, and is thermosyphon cooled. The Westinghouse ignition starting and lighting system is in use on this model and the installation in the Continental motor is an extremely neat job. The running gear consists essentially of a disk clutch, selective gearset and three-quarter floating axle. The wheelbase is 112 inches, tires 33 by 4, and the drive left and control center. The platform rear suspension on this model is another feature.

Another entirely new car offered by the Davis Company for 1914 is the 6-50. This is of European design, and selling at \$2,150 in five-passenger form, with its D-shaped radiator, graceful cowl, clean running boards, bell-shaped body back and low rakish appearance, assisted by the curved fenders, neat appearing dash and general constructional layout, make it different from many sixes. A Continental motor of 3.75 by 5.25 inches is used, and with the disk clutch and four-speed gearset make a standard power plant. The wheelbase of the new six is 128 inches, and the drive left, with center control. Gray and Davis lighting and starting is stock equipment.—Geo. W. Davis Motor Car Co., Richmond, Ind.

#### Day Utility a Convertible Type

The Day Utility car is really two cars in one for although it is normally a five-passenger touring car, it may quickly be converted into a light delivery vehicle with a carrying capacity of from 1,000 to 1,500 pounds. Both front and rear seats are removable and when the vehicle is to be used as a delivery, these may be set aside and special delivery seat and body fitted in place. If desired, the rear touring car seat only can be removed, leaving the front seat in place. Thus the rear portion is available for carrying purposes, while a covering which is furnished with the car can be slipped over the front seat upholstery to protect it while the vehicle is doing its delivery work. A covered body is also furnished as an extra and takes the place of the touring body completely. Patent locks hold the seats in place.

The Day Utility car is equipped with a four-cylinder 4 by 4.5 inch motor of the L-head cylinders cast in pairs, with a S. A. E. rating of 25.6 horsepower. A peculiar feature of this power plant assembly is the placing of the 20-gallon gasoline tank directly over the motor and under the hood. This gives a very positive gravity feed to the carburetor and at the same time warms the fuel slightly before it is used. The tank is placed elsewhere if the customer desires, but such change is advised against.

The car has a multiple-disk clutch, three-speed gearset, floating rear axle, double brakes acting on 14-inch drums, right steer and center control. Its rear springs are three-quarter elliptic and the front semielliptic. It is equipped with 34 x 4 inch tires, has a wheelbase of 115 inches and sells for \$1,500 with body equipment for both passenger and delivery car use.—Day Automobile Co., Detroit, Mich.

#### De Soto Has a New Six

De Soto has brought out a new six which is in the \$2,000 class. This chassis is equipped with either a two, four, five or seven-passenger body and weighs 3,500 pounds. The wheelbase is 132 inches. The motor used in this car is the Beaver Six. It has a bore of 4 inches and a stroke of 5 inches. The cylinders are



cast in pairs and are fitted with pistons which are provided with oil grooves. Electric lighting is provided on the car and ignition current is furnished by a Remy magneto, forming part of the dual system which is completed by a set of dry batteries. One of the novel features of construction of this car is the frame. For half its length at the forward end it consists of a double frame which is really a frame within the main frame. The sub-frame furnishes the three point of support for the motor, while the main frame consists of a channel beam which is over 4 inch in depth and 2.5 inches in width. The thickness of the stock is 3-16 inch and the main frame is reinforced by broad and heavy gusset plates which are hot-riveted across the corners at the rear of the frame. The frame is a double drop. Thirty-six by 4 inch tires are carried all around and the wheels are equipped with Firestone demountable rims.—De Soto Motor Car Co., Auburn, Ind.

### Detroit Out with Larger Motor

The Detroit in the new series is the same mechanically as heretofore, with the exception that the bore and stroke of the motor have been increased from 3.375 by 4.75 to 3.5 to 5 inches, raising the normal horsepower from 25 to about 32. Though selling for \$900, as formerly, with full equipment, the Detroit is now also offered at \$1,025, with Remy cranking by electricity.

The new Detroit motor is the same in general design as it was, the cylinders being of the L-head type, and cast in unit, with valve mechanism inclosed on the right side. The crankcase is of the barrel form with oil pan at the bottom. Bolting to the rear of the flywheel housing is the gearbox, and since this, as well as the multiple disk clutch, are housed as a part of the motor, the unit power plant construction, so often used in cars of today, is made use of. The crankshaft is carried on two ball-bearings.

In the Remy electrical system fitted to these cars, the ignition function is a part of the electric generator and mounted on the right side, driven by shaft. The electric cranking motor is separate and located at the front, driving the crankshaft through inclosed connection. The Detroit Company makes a point of the fact that the cranking outfit fits any Detroit car, old or new. Those who have Detroit cars may have this starter installed and thus bring their cars up-to-date, while the new owner may purchase his car at \$900 without this advanced equipment, with the assurance that he may easily have the electric motor applied whenever he wants it for \$125 more. When the Remy system is not supplied a high-tension magneto is fitted.

The tires are 32 by 3.5 inches in size on demountable rims. The wheelbase is 104 inches. Left drive and center control are featured.

Besides the touring cars, a roadster of attractive type is built upon the Detroit chassis.—Briggs-Detroit Co., Detroit, Mich.

### Dispatch Adopts Water Cooling

One chassis with two styles of bodies, a roadster and touring car, is the offering of the Dispatch company. The chassis is 120-inch wheelbase and carries 36-inch tires. Of chief interest is the change from air-cooling to water, the motor being 3.75 by 5 with the thermo-syphon system of cooling. The oiling system has been changed from gravity feed and splash to forced feed through copper tubes to the bored-out crankshaft and all bearings. Elliptic springs are used front and rear and emergency brakes have been installed as a complement to the foot brake, both sets being inclosed within the brake drum housing on the rear hubs. The rear axle is one-piece, the differential being a component part of the gearset which is located amidships. The axle is tubular and to it are braced the spring seats, brake pivots and disks that inclose both sets of brakes. Two sets of annular balls are used in each wheel, one set 1-2-inch and the other 3-8. The Dispatch bonnet is out of the ordinary, the design being best described as a full length backbone 6 inches wide and 1 inch high. The top of the radiator and the cowl both have a riser to conform to this backbone and accentuate the length of the

hood by this double extension. A design patent has been secured for this.—Dispatch Motor Car Co., Minneapolis, Minn.

### Dorris Has Numerous Small Changes

Experience in development behind Dorris cars extends over a period of nine years, which has been spent on a single chassis. In presenting the latest product, model I, a car which shows numerous, though minor, changes from previous practice, is offered. The improvements are free from radical changes and experimental ideas, retaining all the proven Dorris features which have been refined from year to year with the addition of up-to-date equipment.

The four-cylinder overhead-valve motor of 4.375-inch bore and 5-inch stroke, with its cylinders cast in pairs and the special Dorris dry-plate clutch in the fan flywheel, and three-speed gearset are retained as features of the Dorris unit power plant.

Refinements incorporated in this year's motor consist in greater accessibility of camshaft gears, bearings and starter mechanisms, due to a slight rearrangement of the motor accessories. A notable increase in power has been accomplished by the use of larger valves and freer exhaust. The dimensions of the exhaust pipe have been changed from 3.25 to 3 inches, this permitting a rapid escape of the exhaust gases and consequently less heating of the motor.

In the new Westinghouse starting and lighting system control features are built integral with the generator, eliminating a number of parts and extra wiring, thus making for simplicity. The starting motor is built integral with the engine. While Dorris engines have always been conspicuous for the smooth operation this has been improved by lengthening the connecting rods 2 inches, so that they are now 12 inches long. The unusual lack of vibration is held directly accountable to this change and also to the lighter pistons by which possibility of the piston clink is eliminated.

In the gearset the general construction remains unchanged, retaining the three-speed selective set mounted on adjustable Timken roller bearings. The principal improvement is the center control in conjunction with the left drive. The gear change levers were in the center last year, but for this year have been moved far enough forward to allow the driver to pass the levers without interference.

A novel location for the gasoline tank is obtained by placing it lengthwise of the chassis at the left side, immediately under the body. The filler cap and gasoline gauges are accessible under the front floor boards. Formerly the tank was hung at the rear, as usual, with pressure feed systems, but the danger of damage by collision induced the Dorris engineers to place the tank where it would be both protected and inconspicuous.

The exterior of the body is noticeable for its graceful lines. The design is of the modish straightline type, with no projections of parts and with clean running boards. The roomy tonneau, with spacious doors, makes for comfort, together with the unusually soft-rolled edge upholstery. At the rear the body is hung, as formerly, on a platform type of spring, which the maker believes tends toward easy riding.

Perhaps the chief feature of the equipment is the one-man-top, with which the new cars are supplied. Another feature is the power-driven tire pump. The two bodies fitted to the single chassis are a five-passenger car at \$2,500, and a seven-passenger car at \$50 more. These prices are the same as obtained last year.—Dorris Motor Car Co., St. Louis, Mo.

### Duryea Has Better Cooling Surface

Two roller-drive chassis, with a number of detailed improvements, are offered by the Duryea Motor Company. The two-cycle air-cooled motors in use on these chassis, which are similar in every respect, but wheelbase one being 86 and the other 96, have had the flange arrangement bettered so as to effect more efficient cooling. The spark plug opening has been placed at one side of the cylinder, so as to bring the spark in the deflector pocket, thus affording a better means of firing. Aside from the

motor changes mentioned, a few are to be noted in the running gear. The nut which holds the driving rollers to the shaft is on the inside now, instead of on the outside, as previously. This permits the rollers to be closer to the spokes of the wheel. Another slight change has been made in the primer in use. Instead of drawing priming liquid from the main fuel supply a separate priming can is provided which is designed to permit the use of some volatile liquid to gain easy starting. In the matter of body changes, the cowl projects back farther from the dash, thus offering more protection for the driver, from wind and rain. The Duryea is the only two-cycle pleasure car on the present market, and the motor, a two-cylinder affair, has a bore and stroke of 3.75 by 3.75.—Duryea Motor Co., Saginaw, Mich.

### Empire Enlarged This Year

Although still known as model 31 this year's Empire is a much enlarged and refined edition of the model 31 Empire brought out for last season. These refinements are almost entirely in the nature of comforts for the driver by increasing the equipment, improving the upholstery and giving a more elaborate body design. All these features are included while the price is cut \$50. The biggest change in the chassis is in the wheelbase which is now 6 inches longer. Last year it was 104 inches and it is now 110 inches. Some of the distinguishing features of this car are its unit power plant, three-point suspension, accessibility of the valve, clutch and gearset action and the use of only one universal joint in the drive system. The car has right drive and the emergency lever and gearshift are located in the center. The ignition system is a little different from the ordinary as an Eisemann magneto with fixed spark is used thus eliminating the hand spark control from the steering column which now has only one lever which controls the throttle. The standard body furnished with the Empire model 31 car is a five-passenger touring. It is constructed along modern lines having a cowl dash, straight line body with turkish upholstery and upholstered door ledges.—Empire Automobile Co., Indianapolis, Ind.

### Enger Continued Without Change

Enger cars are all built on the same chassis. The touring, however, differs from the others in that it has a new type of body, fenders and windshield. No changes are to be noted in the line, the motor being a four-cylinder, 4.5 by 5.25-inch, of the L-head type, and with the cylinders cast in pairs. The electric lighting and cranking system is a North-East, and while right drive is retained, the control levers are placed in the center.—Enger Motor Car Co., Cincinnati, O.

### Fal Has Original Body Design

Original body features have been brought out in the latest product of the Fal Motor Car Co., which are in keeping with the desires of a number of buyers for a racy-looking car and yet one that is not awkward or in the freak class. The Grayhound may be transformed into a sleeper in a few minutes and has facilities for carrying all accessories in out of the way places.

As may be seen from the illustrations, the body is streamline throughout. By pushing the seat cushion forward upon the footboards there is exposed sufficient room in the rear deck to admit a 6-foot person whose head is supposed to rest on the seat cushion. When not in use as a sleeping compartment the rear deck may be used as the extra tire-carrier as the illustration shows. The entire length of the sleeping portion is 8 feet and the height sufficient to permit of the sleeper turning.

A single headlight is placed in the center of the hood extension, the radiator being about 4 inches behind the light, and protected by the metal work. The headlight is adjustable by set-screws so that it may be tilted in any desired position.

Two fuel tanks are carried, one in the rear of the deck and another in the cowl, the gasoline being fed to the cowl tank by air pressure and then to the carburetor by gravity.

The filler for the fuel is under the hood as is the water neck.

The car is equipped with a Buda motor, 4.25 by 5.5 inches, has a three-speed gearset and floating rear axle. The motor to wheel ratio is 3 to 1 on direct, the wheelbase 114 inches, and the tires 34 by 4 inches.—Fal Motor Car Co., Chicago, Ill.

### Fiat Two Fours and a Six

Three models known respectively as 54, 55 and 56, the first two of which are four-cylinder types and the third a six are put on the market by the Fiat company. The Fiat design is distinguished by the fact that the motors are all of the block type even the six-cylinder being a very short overhaul length. The bores of the four-cylinder models are respectively 110 and 130 millimeters and the strokes 150 and 170 millimeters. This gives motor sizes of about 4.4 by 6 inches and 5.12 by 6.75 inches for the four-cylinder cars. The six-cylinder car has the same bore and stroke as the smaller four. The three models are rated respectively at 35 and 55 for the two fours and 50 for the six-cylinder car. The cylinders are all of the L-head type carrying the valves on the right side. The intake and exhaust manifolds are cast with the cylinders, the latter being entirely within the casting while the intake has merely a small outer manifold. Helical gears are used on all models to drive the camshaft while the magneto, water pump, etc., are operated from a transverse shaft.

Pressure feed lubrication is used, the oil being circulated by a gear pump. All motors have a centrifugal pump for water circulation and all use a honeycomb radiator with a fan formed by the pitched blades of the flywheel. Dual ignition system is used, the Bosch ZR-6 being used on the six-cylinder car and ZR-4 used on the two four-cylinder models. All three models are equipped with the Westinghouse electric lighting and starting system used in connection with a Willard storage battery. Disk in-oil clutches are used, the friction faces being steel against steel and the clutch being housed back of flywheel. All models have four-speed selective gearsets, geared direct on fourth speed. Model 54 has a high gear ratio of 3.28 to 1, model 55, 2.70 to 1 and model 56, 3.06 to 1. These reductions represent the ratios in the rear axle which in all cases are of the semi-floating bevel type with pressed steel housing. The wheelbase for model 54, 55 and 56 are respectively 123, 128 and 135 inches and all have 56 inches tread.—Fiat Automobile Co., Poughkeepsie, N. Y.

### Firestone-Columbus with Minor Alterations

The Columbus Buggy Company has been content to confine its changes to a few minor alterations and substitutions. The Gray & Davis starter is used now, the upholstery of the bodies made a little heavier, and a higher grade of springs is utilized to improve the riding qualities of the car. The product is marketed under the name of Firestone-Columbus, and includes four and six-cylinder models in a variety of body styles.

There are two four-cylinder motors, the one used on the roadster, touring car, and three-passenger coupé has a bore of 4.125 and a stroke of 5.25, while the 45-horsepower motor on the race-about is 4.25 by 5. The six-cylinder motor has its cylinders cast in sets of three, and has a 4.125-inch bore and a 5.25-inch stroke. On the six-cylinder models, on which there are five body styles, the Gray & Davis electric starter is fitted, but the four-cylinder cars are not equipped in this manner.—Columbus Buggy Co., Columbus, Ohio.

### Flyer, a New Small Car

The Flyer, a brand new car for 1914, is a light four-cylinder water-cooled car which has the distinguishing features of selling for \$550 with starter and weighing equipped but 750 pounds. A block motor having a bore of 2.75 inches and a stroke of 4.5 inches is used. This miniature power plant unlike most small motors is cooled by a pump circulated water system. The crankshaft is carried on three bearings and a vacuum feed oiling system is used in which the lubricant is automatically maintained at the same level, and fed by the splash of the connecting rods.

This car is not in the cyclecar class as it is a real automobile



throughout. The multiple disk clutch transmits the power through a two-speed selective sliding gearset, which is inclosed in a housing bolted to the crankcase, to a 1.125-inch driveshaft. The shaft is inclosed by a torque tube 1.75 inches in diameter. The rear axle is a bevel type geared at a reduction of 3.5 to 1. The front axle is tubular.

The control system by which the steering and driving of the car is manipulated is thoroughly up-to-date in every particular. The steering wheel is on the left side of the car and the steering motion is imparted by a hardened worm. The steering column is 2 inches in diameter and the steering wheel 15 inches. Advantage is taken of the long cowl to mount the gasoline tank in this advantageous position, a good gravity head for the fuel flow thus being secured. The capacity of the tank is 10 gallons.

A racy appearance is given the car by its relatively long wheelbase of 100 inches and the full set of 28 by 3-inch wire wheels. Two sets of brakes are provided, the hand brake lever and the gearset lever are both mounted in the center.—Flyer Motor Car Co., Connersville, Ind.

### Ford T Without Changes for 1914

The Ford car which is standardized and which was produced to the extent of about 200,000 cars for last season is to be continued on an even larger manufacturing scale this year. Roadster, touring car and town car are offered on the 100-inch wheelbase chassis, the prices being \$500, \$550 and \$750 respectively.

The motor is a four-cylinder block-cast type with the water jackets and upper half of the crankcase integral with the cylinder casting. The lower half of the crankcase which is a one-piece pressed steel affair is extended so as to form the bottom housing for the entire power plant. The cylinder size is 3.75 by 4.

There are four complete units to the construction of the Ford chassis. These are the power plant, the front axle, the rear axle and transmission parts and the frame. In the scheme of design used, each unit is suspended at three points of the chassis, making a flexible whole.

The clutch is a multiple-disk running in oil and this together with the flywheel-magneto are housed integrally with the motor.

The Ford car has a planetary transmission of the spur gear type and the control and steer are on the left side. There are three pedal controls operating the low, high and reverse speeds and brake on the transmission. The hand lever for neutral and the emergency brake lever are on the left. Besides the service brake on the transmission, the emergency acts on the rear wheel drums. Both front and rear springs are semi-elliptic transverse. With the Ford triangular drive system, drive and axle shafts, universal joint and driving gears are all inclosed within a housing as a unit. The Ford differential is of the three-pinion bevel type, and a tubular steel housing incloses it together with the vanadium steel axle shafts.

The Ford cars have 30 by 3 front and 30 by 3 1-2 inch rear tires, and all cars are sold completely equipped.—Ford Motor Co., Detroit, Mich.

### Franklin Makes One Chassis

One chassis with six different body types constitutes the entire Franklin line for this season. The new series is known as the Franklin Six-Thirty and includes a six-cylinder motor mounted on a chassis which still maintains the feature of lightness that has characterized the Franklin line for some time past. Many constructional changes have been made this year. The car now has left drive and center control. The motor has been improved by fitting a compensating valve mechanism which takes care of the overhead action in such a way that compensation is made for difference in temperature and the clearances change but little as the motor becomes warm. The valve lifter rods are now inclosed with the result that the motor is much more quiet in operation. The long overhead walking beam support which formerly extended over all the cylinders has been eliminated. Each cylinder is now an independent unit which can be removed without disturbing any other. Another change is in the timer, mag-

neto and generator gears which are now located in the front cheek piece of the motor in the same housing that contains the silent chain of the Entz motor-generator. The car is equipped with electric lighting and starting systems. The running boards are clean, the tool box being carried between the running board and the sill folding down on the running board when open. The bodies which are furnished are a five-passenger touring, three-passenger roadster, coupé, sedan, limousine and berline.—H. H. Franklin Mfg. Co., Syracuse, N. Y.

### G. J. G. Made in a Raceabout

So far the complete program of the G. J. G. Motor Car Co., White Plains, N. Y., for the new year has not been made known. The only car upon which information has been given out is the special racing machine. This is a stripped chassis, specially equipped for high speed work, with which a speed of 70 miles per hour is claimed. The engine is a four-cylinder, 4.75 by 5-inch, with cylinders cast in pairs. The clutch is of the leather-faced cone type, with springs beneath the leather designed to make a quick get-away. A three-speed Brown-Lipe gearset is supplied and a floating rear axle. Special magnetos and carbureters intended for high speed work are supplied. The wheelbase is 121 inches, tires are 34 by 4 inches, and though wood wheels are regular equipment, wire wheels are offered as an option.—G. J. G. Motor Car Co., White Plains, N. Y.

### Gleason Retains Two-Cylinder Motor

As the only two-cylinder car, and likewise the only buggy-type car of the four-cycle type on the American market, alterations in the constructional features of the Gleason cars made by the Bower Machine Works Company are very slight. There have been no changes in the car as it appeared last year, except that an emergency hand-lever brake is now provided instead of the pedal arrangement employed formerly; the torque bar and a few other minor points have been strengthened.

The two-cylinders of the engine have a bore of 4.75 and a stroke of 4 inches, having an S. A. E. rating of 18 horsepower. The cylinders are of the L-head type, cooled by thermo-syphon water circulation, transmission features include disk clutch, three-speed gearset and shaft drive to floating axle. The gear ratio on high is 6 to 1, half again as much as that usually employed in four-cylinder cars. The wheelbase is 96 inches and the tires are solid 36 by 3 inches. The Gleason sells at \$850 as a two-passenger roadster, and \$1,000 as a five-passenger touring.—Bower Machine Works Co., Kansas City, Mo.

### Glide Includes Electric Starting

Except to include an electric starter, no change whatsoever has been made in the Glide. The addition of the starter jumps the price somewhat, the new figure being \$1,840, as against \$1,690, which represents the difference in cost between the old equipment and the new.

The Westinghouse starting and lighting system has been adopted, and in addition to this the Glide features include a unit-power plant, long-stroke motor, inclosed valves, center control, left drive, and a motor-driven tire pump.

The motor is of the four-cylinder type, 4.125 by 5.25, cast en bloc, giving a rating of 38 to 42 horsepower. The wheelbase is 118 inches.—Bartholomew Co., Peoria, Ill.

### Grant a New Small Car

The Grant car which was a newcomer to the industry last summer has a four-cylinder motor, driving through a cone clutch and propeller shaft to a two-speed gearset mounted in unit with the rear axle which has a gear differential and bevel driving gears. The car weighs about 1,000 pounds total and is capable of a speed of 50 miles an hour according to the maker.

The motor is a 2.75 by 4 L-head block cast type. The cylinders and crankcase are cast in one piece, thus making for simple production. The crankshaft and its bearings are accessible through a cover plate at the bottom. The horsepower is 16 at a normal

crankshaft speed of 1,600 revolutions. The manifolds are cast integrally with the cylinders and with water jackets also an integral part, thermo-syphon cooling is used. The cylinder heads are removable in one piece, fourteen bolts holding this plate in place. It carries spark plugs, priming cocks and water outlet connections. The lubrication is by the splash system, the oil being carried in a 2-quart reservoir.

The flywheel is uninclosed and back of it is the cone clutch which connects with the inclosed propeller shaft with its universal joint at the front end. The rear axle with which the gear-set is a part is three-quarter floating and carries two sets of brakes. The gear ratio is 4.5 to 1 on high.

A single half-elliptic transverse spring carries the frame at the rear, while elliptic front springs take care of the front end. The fronts are 26 and the rear 47.5 inches in length.

The drive is on the left and the control levers in the center. The little machine, which is made in roadster design only, has ample room for two passengers without interference with the control parts. The gasoline tank is under the cowl and holds 6 gallons, which should run the car from 180 to 200 miles, it is stated.

The car sells for \$495 equipped. It has a streamline body with a rounded nose radiator; has wire wheels carrying 28 by 3 inch tires and its wheelbase is 90 inches.—Grant Motor Co., Detroit, Mich.

#### Great Eagle Changed to Left Drive

Great Eagle cars are not subject to yearly model changes, the engineers making custom of applying changes whenever it is found that the cars can be improved, each car being built as a separate unit, instead of a number being turned out at one time exactly alike.

The only changes of the past 12 months in Great Eagle construction is in the adoption of an electric lighting and cranking system, and a change to left drive and center control. The company has been producing cars of this newer construction for the past five months.

As continued for the new season the car appears as a four-cylinder car having a T-head motor of 4.75 by 5.5 bore and stroke, giving it an S. A. E. rating of 36.1 horsepower. The motor has cooling water circulated by a pump and pressure oiling maintained by a gear pump. The ignition is double and an Autolite cranking and lighting system is supplied. A cone clutch is used and a three-speed gearset located amidships. The other points of construction include a floating rear axle, 37 by 5-inch tires, platform type of rear springs and roller bearings throughout gearset axle and wheels.—U. S. Carriage Co., Columbus, O.

#### Great Southern Discontinues Small Car

Concentration upon a single car marks the program of the Great Southern Automobile Co., Birmingham, Ala. Discontinuance of the smaller car is the chief alteration of this factory for the new season. The model which has been dropped was known as the Great Southern 30. The other chassis, known as model 51 last year, and now bearing the title model 50, and carrying a seven-passenger touring body, forms the sole object of this factory's efforts.

Alterations in this model are of minor significance, except the change to center control, and the provision for the installation of any standard type of motor starting and lighting system. The model 50 is a four-cylinder car of 5.19 by 6 inches bore and stroke, giving the unusually large S. A. E. rating of 43.05. The cylinders are cast in pairs and are of the L-head type. Water is circulated by a pump and a combination of splash and pressure lubrication is obtained by a gear pump. Ignition is dual. The transmission system includes a cone clutch, a three-speed gearshift amidships of the frame, and a semi-floating rear axle. The wheelbase of the car is 128 inches and tires are 36 by 4 inches in front and 36 by 4.5 inches in the rear. The rear springs are three-quarter elliptic.

The steering wheel remains on the right side, while the control

levers have been shifted from the right side of the driver's compartment to the center. The price is \$1,750, a drop of \$350.—Great Southern Automobile Co., Birmingham, Ala.

#### Great Western Adds a Chassis

An addition to the line of the Great Western Company is a chassis with a wheelbase of 112 inches, for which six-passenger, sedan and limousine bodies are offered. The one carried over has a wheelbase of 118 inches and the body offerings include roadster and four and five-passenger touring bodies. The bodies all have been redesigned and there are such refinements as combination dimmer headlights carrying two sizes of lamps and controlled by a switch. Right-hand drive and right-hand control are retained.

The power plant is the same as before with a few improvements. For instance, the brakes have been changed from double internal to internal and external. It is an L-type, four-cylinder, 4 1-4 by 5 1-2, with the cylinders cast separately and with the valves inclosed. The Gray & Davis electric starting and lighting system is mounted on the left side of the motor and drives through steel gears. As a starter it operates at one-twenty-fifth crankshaft speed. It delivers its maximum output of 20 amperes at 6 volts at a car speed of 12 miles per hour.—Great Western Automobile Co., Peru, Ind.

#### Havers Has Two Sixes

Consistent with its policy of making six-cylinder motor cars exclusively the Havers company continues for this year its two sixes, namely, a large design rated at 60 horsepower and a smaller car at 44 horsepower. Except for a few minor refinements mechanically, the slight increase in the size of the motor in the larger car and the bringing of the body designs up to the minute, the new Havers cars are the same as last season. Right drive is retained.

The large 6-60 model which features the line is now in its second year. The dimensions being 4.125 by 5.25, as against 4 by 5 last year, giving rise to the change in model designation from 6-55 to 6-60. No changes in the actual design of the motor are to be found, but the Gray and Davis starter is added. The smaller six retains its 3.75 by 5 power plant without change. The cylinders are L-head constructed with inclosed valves on the left.

Throughout both chassis the same design is found, and save for the difference in dimensions, there is no structural deviation. The unit power plant includes flywheel, clutch and gearset which are completely housed in extensions of the crankcase and portions which bolt to it through flanges. The clutch is a multiple disk type and the gearset a three-speed one.

With wheelbase of 122 inches for the 6-44 and 128 inches for the 6-60, the Havers cars are given plenty of room for bodies which are in accord with latest body maker's ideas. The cowl board of the 6-60 model is exceedingly well arranged and attractive. Running boards are clean and fenders have been given a new curve to conform more closely to the wheel curves. This model has a Jones starter.—Havers Motor Car Co., Port Huron, Mich.

#### Haynes Adopts Electric Gearshift

Two sixes and a four are made by the Haynes company this season. All three models incorporate the electric gearshift, a feature which has just been added to the line put out by this company. The motor and chassis dimensions remain the same throughout as last season and only a few changes of a minor nature remain to be recorded. A new pressure feed gasoline system supplants the gravity tank. A power tire pump has been added and the body lines have been changed to bring them up to the dictates of this year's style.

Models 26 and 27 are the six-cylinder cars and model 28 is the four. The power plant dimensions of the sixes are the same, 4.25 by 5.5, and the similarity of the design is carried throughout except for a difference of 6 inches in wheelbase and the consequences of this dissimilarity.



The cylinders are cast in pairs and are offset from the natural axis .5 inch. The compression by gauge on these motors averages 59 pounds and on factory dynamometer tests a maximum horsepower of 65 has been secured. Four main crankshaft bearings are used, 11-inch connecting rods, a valve system operated through spiral gears.

The electric equipment includes a dual system of ignition and a Leece-Neville cranking and lighting outfit. The running current is furnished by a Simms magneto. The Haynes contracting band clutch is continued, a hardened steel band contracting on a hardened steel drum. The gearset is carried on Timken roller bearings. The rear axle is a floating design and both sets of brakes are on the rear wheels.

The four-cylinder model follows the design laid out above exactly. Three instead of four main bearings are used in the crankshaft and lighter parts where possible are used. The rear axle is a McCue and delivers the drive through a flange instead of the jaw clutch.—Haynes Automobile Co., Kokomo, Ind.

### Henderson Enters Field of Sixes

Adoption of the six-cylinder car for the first time is a feature of the Henderson product for 1914. In addition to the new six there is a new four called the de luxe, while the light four which was the sole chassis model for 1913 is retained. The new six-cylinder model has a 3.75 by 5.5 motor. The de luxe four has cylinders 4.125 by 5.5 inches in size. The light four which is carried over from this year with minor refinements is of the same bore as the new four, but its stroke is only 5.25.

The three models are all of the same general chassis layout, differing only in power. These are furnished in five-passenger, touring, roadster, coupé and sedan body. Wheelbase of the three models for the new season are six, 126 inches, de luxe four, 116 inches and little four, 116 inches. Tires on six and de luxe are 35 by 4.5 inches and 34 by 4 on light four.

With the new four and six-cylinder cars an option of either wood or wire wheels is offered without change in price. In addition a kerosene carbureter is named as optional equipment at a slight extra charge.

Motor starting is by a Ward Leonard electric cranking and lighting system the same as last year. The hood is shorter in the new cars in proportion to the size of the body and the dash gasoline tank is slanted down and inwards to give more knee room in the front compartment. A lock has been added to the gearshift lever to hold the second speed gears in mesh. The fuel filler pipe comes out of the dash in the new car instead of the top of the cowl as in former practice.

The Henderson center control and left drive continues in the 1914 series, the central control lever being placed between the two front cushions and instead of the conventional H-quadrant being placed in the horizontal frame it is mounted vertically and the lever moves up and down and forward and backward. Brakes on the new cars are concentric expanding; the older model has the bands side by side. The Stutz rear system is used on fours, but the six and de luxe models have Weston-Mott floating axles with Covert gearsets.—Henderson Motor Car Co., Indianapolis, Ind.

### Herreshoff Offers a Four and a Six

Herreshoff makes two chassis models this year, these being a four and a small six. A six was offered for the first time for the 1913 season by this company. To these two chassis are fitted any desired type of body.

Though essentially the same in design and construction as the cars offered for 1913, the new models have several refinements and improvements, chief of which are the complete electrical equipment for cranking, lighting and ignition and the incorporation of four-speed gearsets in all models.

Aside from the application of this electrical system which is of the Westinghouse make of the two unit design, motor and generator being separate, the engines show no noticeable changes in design or arrangement of essentials. Both the four and the six

have 3.375 by 4.5 motors, and are rated at 30 and 40 horsepower respectively. Although the six is a T-head type, while the four-cylinder is an L-head design, the same general characteristics of construction are in evidence on each. Differences due to manifold arrangements occasioned by the different cylinder castings are of course necessary, but as to crankcase construction, methods of attaching the gearbox for the unit power plant feature, and so on, show that they are similar.

The multiple disk clutch and four-speed gearset are identical for both cars as to design, although the six has more plates to its clutch—twenty-four as against twenty for the four-cylinder model. The drive shaft of these cars is inclosed within a torsion tube with a universal joint at the front end. Radius rods run diagonally from the rear axle to the tube to aid in the maintaining of alignment. The rear axle is semi-floating.

The main point of difference in the two chassis is the spring suspension. The six-cylinder model has a platform rear hanging, and the four has half-elliptics shackling to spring horns at their rear ends.

The wheelbase of the six is 124 inches, while that of the four-cylinder touring car is 110 inches. The roadster four-cylinder has 100 inches for this dimension. The Herreshoffs have demountable rims with one extra and equipment is complete in all details. Tires are 34 by 4 on the six and 32 by 3 1-2 on the four.—Herreshoff Motor Co., Detroit, Mich.

### Holly Has a New Chassis

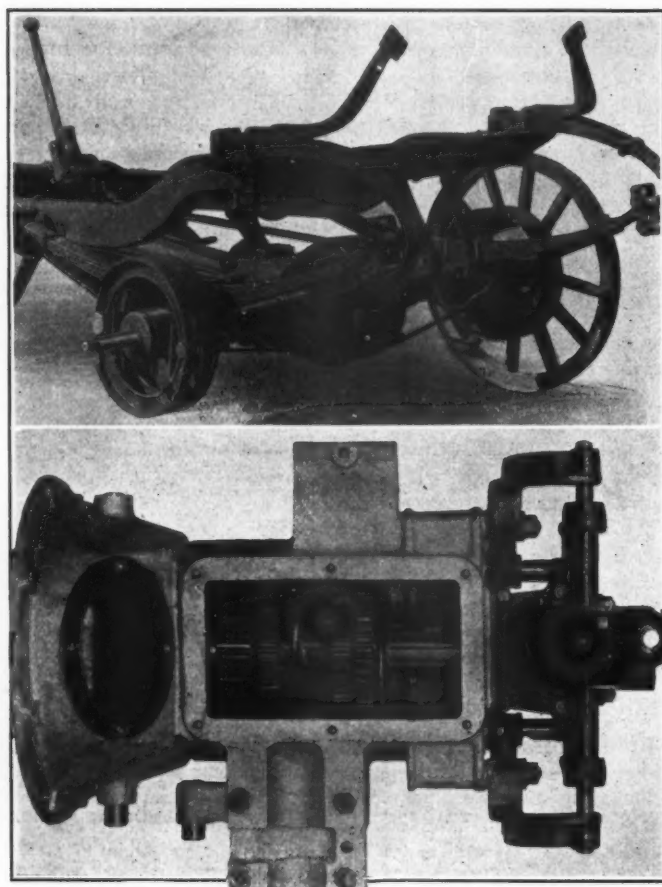
A new chassis known as model A-1 has been put on the market by the Holly Motor Company. This car which is known as the Holly Six is turned out in four body types, including a runabout, two touring models and a demi-tonneau. The six-cylinder motor is rated at from 45 to 60 horsepower and is a 4 by 5. The cylinders are cast in threes and carry the intake valve on the right side and the exhaust valve on the left side. The camshaft is driven by spiral gears. The exhaust and intake manifolds are cast separately and are removable. A splash system of lubrication in which the oil is circulated by a gear pump provides the motor lubrication while the cooling is taken care of, also by a gear type of water pump, which forces the cooling liquid through a honeycomb radiator. The electrical equipment consists of an electric starting system if desired and a dual-double ignition system provided with two sets of spark plugs. If desired an air starting system will be fitted instead of the electric. The Ward-Leonard system is used for the electric lighting of the car regardless of which starting system is provided. The gearset is in a unit with the rear axle and provides three forward speeds giving a ratio of 3.25 to 1 on third or direct. The gearshift control is in the center as is also the emergency brake lever while the steering gear is mounted on the left. The wheelbase of the car is 130 inches and the tread 56 inches. A semi-underslung frame is used while the rear springs are semi-elliptic underslung. The weight of the chassis is 3,500 pounds.—Holly Motor Co., Mt. Holly, N. J.

### Howard Has a Six

For this season the Howard company is putting a six on the market. The power plant forms a unit with the clutch and gearset. The 4.125 by 5.25 cylinders are cast in blocks of three and the valves as is common with left drive cars are located on the right side of the motor. The motor is oiled by combination splash and pressure feed and the lubricant is circulated by a piston pump driven off the camshaft. The electric system includes a Jesco cranking and lighting outfit and a Bosch double ignition system. The carbureter is a Stromberg fed by pressure from a tank on the rear of the chassis. The clutch is a cone, the gearset furnishes three speeds and the axle a floating design giving a reduction of 3.44 to 1. The car has a wheelbase of 130 inches and the tires are 36 by 4.5 all around.—Howard Motor Car Co., Connorsville, Ind.

### Hudsons Made in Sixes Only

Only six-cylinder models represent the Hudson Company this



Henderson rear system above, Herreshoff gearbox and housing

year, it having retired from the four-cylinder field entirely. The model 37 four-cylinder type of 1913 is no longer made. The model 54 six-cylinder car is continued with a number of chassis and body changes, and late in the fall a light six was announced as a running mate.

This latest Hudson is known as model 40, and is really brought out in competition with the average high-grade four-cylinder vehicle now on the market. With a weight of 2,940 pounds, the car is said to be lighter than some of these fours, and its gasoline consumption is claimed to be nearly as low as was that of the model 37 four. The price of this model is set at \$1,750 in touring and roadster designs.

The Six-40 has practically the same type of streamline appearance as has the Six-54, which appeared earlier, although it has a full rounded top hood, as compared with the larger six's type, with a ridge where the top part meets the sides. There are no side lights on the Hudsons, the headlights having provision for dimming for city driving.

But, though in outward appearance the new Six-40 is similar to the Six-54, its mechanical design is somewhat different. The motor is a 3.5 by 5-inch rated at 40 horsepower. The cylinders are in threes with L-heads. The gearset bolts to the rear, making a unit construction. The flywheel is semi-inclosed, which is a new feature to Hudson design. The clutch is a multiple disk type, and the gearset has three forward speeds.

The car is equipped with the Delco electric system for ignition, lighting and cranking. Left drive and center control are featured, as is also the location of the gasoline tank underneath the cowl.

The drive of the Six-40 is entirely new to Hudsons, being of the Hotchkiss type, whereby the propulsion is taken through the rear springs. No torsion rod or tube appears, and the drive shaft, which is fitted with a universal joint at either end is a varying sectional diameter. It tapers from a diameter of 1.75 inch at the center to 1.25 inch at the ends. This varying section protects the shaft against whipping action, which ought take

place in the ordinary shaft of its length—64 inches. The three-quarter elliptic rear springs are underslung, and the frame is tapered from front to rear, instead of being of the bottle-necked form. This makes a cheaper construction, and at the same time is equally as good as any other shape. The rear axle is of pressed steel and floating, while the front axle is of a new type, being of the so-called inverted Lemoin construction, whereby the spindle is at the top of the knuckle, instead of being at its center as in the conventional design. This makes for a flatter axle and simplifies the forging. The speedometer gears are also inclosed in the front spindle. The wheelbase of the Six-40 is 123 inches.

Besides the open bodies a cabriolet roadster is also furnished on this chassis at an extra cost.

The Six-54 retains its 4.125 by 5.25 motor, L-head with the cylinders in threes, and like the Six-40 is made by the Continental Company for the Hudson cars, according to the Hudson Company's designs. The Delco electrical system is also a part of this motor, taking care of all three functions.

The three-speed gearset formerly used has been replaced by a four-speed type with direct on third. The propeller shaft is uninclosed and has two universal joints. A torsion arm parallels it back to the axle housing. The rear axle is floating, while a new feature this year is the mounting of the springs underneath, giving a greater range of spring movement.

The frame tapers from rear to front as does that of the Six-40, and also similar is the mounting of the gasoline tank under the cowl. Left drive and center control also is used this year, the 1913 Six-54 having right drive and control. The whole body design echoes the general lengthening out of the chassis from a wheelbase of 127 inches in 1913 to 135 inches in the new model. The price of the new 54 has been decreased somewhat, it being now offered for \$2,250, as against \$2,450 last year. Equipment is complete in every detail.—Hudson Motor Car Co., Detroit, Mich.

### Hupmobile Drops 20—Continues 32

Hupmobiles of 1914 are very little changed in appearance or in general design over those of the preceding year, except that the smaller Hupmobile 20 is discontinued.

Four body styles of the passenger variety are fitted to the 32 chassis, these being the roadster, four-passenger, six-passenger and coupé cars. All of these are of 106 inches wheelbase except the six-passenger job, which requires that the chassis be lengthened to 126 inches wheelbase.

All of characteristic features which have been incorporated in this model 32 from the first are retained. Its rear spring suspension by the use of a cross spring which hangs at its ends in ball shackles attached to the axle housing and connects at its center with the rear cross-member of the frame is retained. The block-cast motor of the 32 is a 3.25 by 5.5 with L-head cylinders and thermo-syphon cooling, using the flywheel as a centrifugal pump to bring the oil up to a lever from which it can be circulated by gravity. The Bosch high-tension ignition and other features are unaltered.

Mechanically, the greatest difference in the new 32 comes in the addition of Westinghouse electric cranking and lighting employing separate electric motor and generator which are inbuilt into the power plant. The generator driving mechanism and the gearing between the cranking motor and the flywheel ring gear are all inclosed within housings which are integral with the upper half of the crankcase.

The camshaft of the 32 is driven from the rear of the crankshaft by a silent chain. The magneto position is also unusual that unit being mounted on top of the gearset case, and driven by a silent inclosed chain from the camshaft. Due to this position the magneto extends through the dash being covered by an easily removable casing. A hood of aluminum has also been placed over the opposite end of the magneto to protect it against foreign matter.

The car has a three-speed gearset, multiple disk clutch running in oil, propeller shaft inclosed within a torque tube, float-



ing rear axle and its gasoline tank is under the cowl. The bodies are the same as used heretofore.—Hupp Motor Car Co., Detroit, Mich.

### Illinois Making a Four

Specializing on a five-passenger touring model which is a continuation of the K-13 of last year but which is now known as K-14, the Illinois car has but minor change. It is fitted with a compressed air starting system and has right drive with the gearshift control in the center and the emergency brake on the right side. The four-cylinder power plant has its L-head cylinders cast in pairs, the valves all being on the left side. The motor size is 4.25 by 4.75 and it has a three bearing crankshaft. The motor is lubricated by circulating splash system in which the oil is carried by a gear pump. The ignition is Remy dual using the high-tension magneto for running current and dry cells for starting. The carbureter is the Schebler to which the gasoline is furnished from the tank at the rear of the chassis by pressure. The clutch is a multiple-disk with all steel plates running in oil. The gearset is a three-speed selective located amidships. A floating bevel gear rear axle is used and the wheels are 37 by 4 all around. They are fitted with demountable rims. An acetylene tank is included in the equipment, as is also a tire inflating outfit. The wheelbase is 120 inches.—The Overholt Co., Galesburg, Ill.

### Imperial Still Has Four Chassis

There are still four models of chassis which bear the Imperial name for 1913, three of these were four-cylinder types, but in the new series two fours and two sixes are offered. The model numbers are exactly the same as they were. Model 54 is the big six; model 44, which heretofore had a four-cylinder engine, is now the light six; model 34 is the larger of the fours, and models 32 and 33 refer to four-cylinder touring car and roadster bodies fitted to the same four-cylinder chassis.

Each of the four chassis is equipped with a different power plant than it carried heretofore. Model 54 has a 4.125 by 5.25 engine, which replaces a 4 by 5.5. Model 44 is fitted with a 3.75 by 5.25-inch six, instead of its former 4.75 by 5.25-inch four. Model 34's new engine is of the same bore as the old one—4.5 inches, but the stroke is now 5 inches, or .25 inch shorter. The 4.125 by 5.5 inch power plant of the 32-33 chassis has been replaced by a 4.25 by 5.25 inch model.

Whereas, all cars except the larger six, model 54, were driven from the right in 1913, all 1914 Imperials are left-driven. Center control is continued. Splittorf dual ignition is now fitted, while North-East lighting and cranking is fitted to all models as a standard feature.

The new engine in the model 54 has cylinders cast in threes instead of being a block casting as formerly. The engine incorporates the multiple-disk clutch and three-speed gearset in

unit with it, making the three-point suspended power plant construction possible. Its electric unit for cranking and lighting is placed on brackets on the side of the crankcase, and on the end of the pumpshaft. The connection between this and the engine is by silent chain to the crankshaft.

The driveshaft is fitted with two universals and is paralleled at the rear by a torsion arm. The rear axle is floating and has a pressed-steel housing. Brakes are double-internal expanding. The car has a wheelbase of 137 inches and runs on 36 by 4.5 tires. The standard body is a seven-passenger type of latest design.

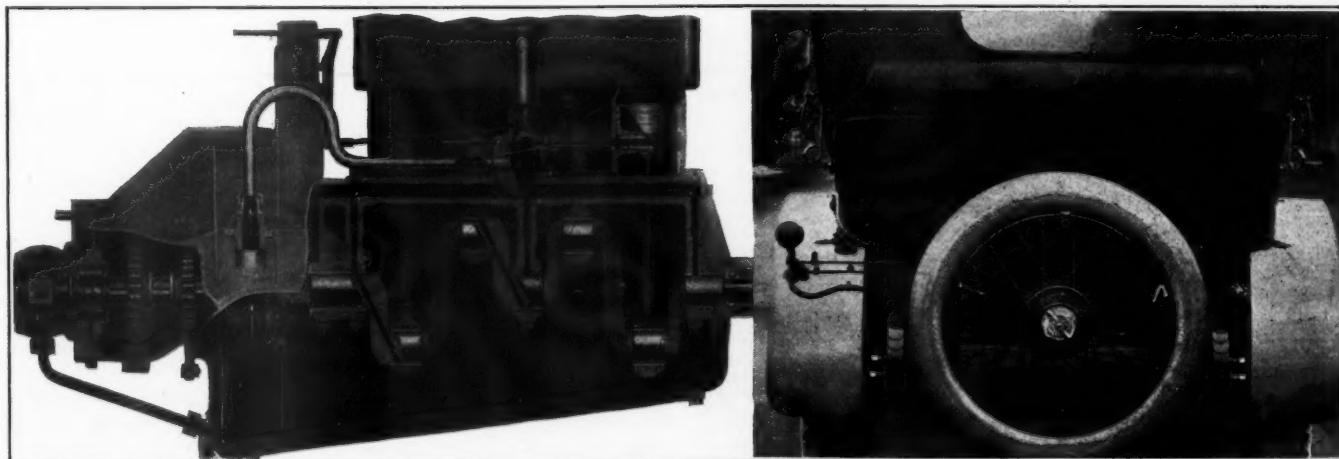
Model 44 is the same in general appearance as last year, but its wheelbase has been lengthened from 122 to 126 inches to accommodate the six-cylinder power plant now used. The engine is of the same general design as that of the larger car. It has cylinders in threes, and the same type of cooling, lubrication, ignition, lighting and cranking systems. But unlike the big six, the drive is through a propeller shaft inclosed within a torsion tube. Diagonal radius rods are also used. The rear axle is floating and of the same design as used on the big car. The tires are 36 by 4.5 inches. A touring body is the standard dress.

The unit construction of the engine, disk clutch and three-speed gearset are also features of the forward unit of the model 34 four-cylinder model. Cylinders are in pairs and L-heads. Lubrication is by constant-level splash, while ignition is of the dual type. Instead of driving through chain connection at the front as in the two sixes, the motor-generator used for cranking and lighting on this model drives by chain at the rear, the crankshaft sprocket being just inside the flywheel flange. The rear construction and drive of this model is similar to type 44. The rear axle is floating and has a malleable housing. The wheelbase is still 118 inches, and the body a five-passenger design. Tires are 34 by 4 inches.

Model 32-33 is a machine of 114 inches wheelbase, and the motor is a block casting like its predecessor. The clutch and gearset are in unit with it. Lubrication and ignition are the same type as used in model 34, but the electric unit drives through chain at the front end, being mounted back of the water pump on the right and connecting to the pumpshaft. The disk clutch has semi-steel plates and the gearset three speeds. The propeller shaft is inclosed and the rear axle a malleable-housing affair of the floating type. Both the touring car (model 32) and the roadster (model 33) are fitted with 34 by 4 tires.—Imperial Automobile Co., Jackson, Mich.

### Interstate Continuing the Six

Announcements of the Interstate company thus far show that the line consists of the 6-45 made last year. The makers state, however, that they shortly expect to bring out another model. The model 45 is fitted with a touring car body having five-passenger capacity and has a power plant which the makers rate at 48 horsepower. The motor is in unit with the clutch and gearset and has



Hupmobile oiling system on left, and Keeton spare wheel carrier on right

the six 4 by 5 cylinders cast together. They are L-head and have the valves on the left side. The manifolds are cast separately. The motor is cooled by water circulating system maintained by gear pump and a honeycomb radiator. The ignition is a double high-tension Mea having the magneto as a running current source and the same battery as is used in the Apple electric lighting and starting system for starting.

The Apple system is fitted regularly to the cars and operates at 6 volts. The carbureter is either a Stromberg or Carter without hot air pipe and fed by pressure in the 20-gallon gasoline tank located at the rear of the chassis. The clutch which is housed in the flywheel and which is a unit with the gearbox is a multiple disk running in oil, alternate disk being faced with raybestos. The gearset is selective sliding and provides four-speeds. The rear axle is floating and delivers the drive through the rear springs. Left drive and center control are used, the wheelbase is 132 inches and wood wheels fitted with demountable rims are supplied as regular equipment. One extra demountable rim is given with the car.—Interstate Automobile Co., Muncie, Ind.

### Jackson Continues Three Models

Three Jackson models, all practically the same as the three models offered last year will be put on the market for 1914. They bear the same names, Olympic, Majestic and Sultanic, and neither the first two which are fours nor the last which is a six have been changed to any great degree other than bringing their equipment and design up to date. In view of this the Olympic, the smaller of the two fours is now fitted with an electric cranking and lighting system and sells for \$1,385 in place of \$1,500, the price of last year. The Majestic now sells for \$1,885, a reduction of \$90 as compared to last year and the Sultanic Six is now in the \$2,000 class, having been reduced in the five-passenger model from \$2,500 to \$2,150.

Practically the only chassis change is the removal of the pressure gasoline tank from the rear of the Olympic. On the 1913 model there was, besides the service tank on the dash, a storage tank at the rear which carried the bulk of the gasoline supply. The gasoline was forced from the rear supply tank to the tank on the dash and flowed to the carbureter by gravity. On the Olympic car for this year only the dash tank is used. The larger four-cylinder model and the six still retain the two tank system.

Slight body changes in keeping with the tendency of the times make their appearance in this season's models. The curve of the fenders has been altered to follow the wheels more closely and the shallow boxes which formerly ran the length of the running boards have been eliminated. The rounded radiators which are a feature of the Sultanic and Majestic cars have been retained but the flat type still appears on the Olympic.

The general design of all three models is the same as far as the chassis are concerned. The motors are all L-head with the cylinders cast in pairs. The motor sizes are 4.125 by 4.75; 4.5 by 5.25 for the four cylinder models and for the six, 4.125 by 4.75. The motor design is conventional throughout. The crankshaft is carried on three bearings. The valves are of tungsten steel and are interchangeable. The electric system includes Auto-Lite starting and lighting units, and a Willard storage battery, the remainder of the starting and lighting units are manufactured by the Jackson company.—Jackson Automobile Co., Jackson, Mich.

### Jeffery Has a Four and Six

Abandoning its former policy of a single chassis model the Jeffery company enters the six-cylinder ranks, although the new four is a car which will form the chief item of production, the six being merely an enlargement of the former to provide for those who wish Jeffery practice in a six-cylinder car.

The Jeffery four-cylinder car listed at \$1,550 as a five-passenger touring car shows many features not generally associated with cars at such a low price. In general, the car has a block cast 3.75 by 5.25 L-head motor, an inverted cone clutch with a clutch brake, a four-speed gearset with central control, splash

pressure motor lubrication, pressure gasoline feed, floating rear axle, 34 by 4-inch tires, 116-inch wheelbase, left drive, patent detachable curtains, demountable rims, and a U. S. L. cranking and lighting system.

The Rayfield carbureter is attached by a single brass intake pipe with one connection at the center of the cylinder casting. Timing gears have spiral teeth. Pressure feed of gasoline is employed with the fuel tank hung at the rear of the car. Cooling of the motor is through water circulation by a centrifugal pump and the radiator, while of the same construction as employed in the older Cross Country models, is a conventional shape. Ignition is the Bosch duplex system. Lubrication of the motor is by combination of force feed and splash system. Electric lighting and starting is supplied by the U. S. L. system whose feature is the entire absence of gears in either the generating or cranking mechanism.

In combination with the flywheel is the cone clutch. On the clutch pedal shaft is mounted the clutch brake. Clutch and motor have three point support, two arms form the rear end of the motor attaching directly to the side frame member while at the front a trunnion block is mounted on the upper side of the front frame member. Behind the clutch is a leather universal, one of the features of Jeffery design.

The battery portion of the duplex ignition system is a set of dry cells. These are hung in a special bracket underneath the cowl where they are protected from rain or dust. The brackets can be slipped out by a loosening of the nuts when a new set of battery is needed. The use of dry cells for the ignition separates the latter entirely from the lighting and cranking system.

Similar in almost every respect with the four-cylinder Jeffery is the six-cylinder. The motor has the same design of cylinders which are of the same dimensions although they are arranged in pairs instead of in a single block.

The six-cylinder motor differs in the fact that the timing gears are chain driven and the fan is an aluminum casting of which the pulley is a part. The Rayfield carbureter is water-jacketed on the six and also the brass intake manifold is water-jacketed.—Thos. B. Jeffery Co., Kenosha, Wis.

### Keeton Retains Its Characteristics

The Keeton company for 1914 will adhere to its policy of manufacturing one chassis only, while in appearance its car still holds to the French type of hood with the dash board radiator. Although building but one chassis model, several new body types have been added to complete the line.

The wheelbase of the chassis remains the same at 136 inches and the six-cylinder block casting of the motor has been retained. Throughout the chassis the general design remains the same as heretofore, although many refinements of details have been made strengthening and simplifying the construction as a whole. A power driven tire pump has been added as standard equipment, a feature which will be appreciated by the motorist who dreads the hand pump.

The Keeton for 1914 carries a top slip roll which is an entirely new and convenient method of disposing of the oftentimes dirty and troublesome top boot when not in use. The cover is fastened to the large curtain at the rear of the top and rolls up compactly somewhat in the manner of an army blanket, the free portion fastening securely to the curtain with clasps when completely rolled.

Last season the Keeton chassis was clothed with three body types—a seven-passenger touring car, roadster and coupé. But the 1914 line includes besides these three a cabriolet roadster, following very closely Kellner's design for this very popular European type of body; a berline-limousine in which great attention has been paid to interior decoration and finish; and a five-passenger phaeton type of body which is convertible into either an open or a closed car.

Electric cranking and lighting on the Keeton is continued as heretofore. Wire wheels are standard on all models with an



extra detachable wheel carried over the gasoline tank at the rear of the frame.—Keeton Motor Co., Detroit, Mich.

### King Increases Bore—Cuts Price

The four-cylinder King car is featured this year by a larger motor at a lower price. Without electric lighting and starting it now sells for \$1,090, a reduction of \$410 under last year's price. With the Ward Leonard electric starting and lighting system \$100 is added. The motor this year is 3.88 inches in bore as compared to 3.75 inches last year and the stroke remains the same, 5 inches. Thermo-syphon cooling is still used and a circulating splash oiling system. The four cylinders are cast in a block and for this season the Stromberg carbureter has been adopted as stock. The Briggs dual ignition remains unchanged. Other chassis features are a 12-plate disk clutch running in oil, alternate disks being faced with asbestos material, a three-speed gearset carried as a unit with the motor, and a floating rear axle. Left drive and center control, featured last year on the King cars, are continued.

The spring feature of the King which has been a noteworthy adaptation of the cantilever rear system is continued without change. This is a modification of the Lancaster type of rear springs, attached to the frame by means of a slotted bracket which permits freedom of movement in an endways direction, but does not permit of movement sideways. The wheelbase remains as before, at 112 inches. One of the features of the car is the clean appearance, the running boards being free. The battery is now carried under the tonneau floor and the tool box is also out of sight. The touring body is a five-passenger type of modified streamlines having a cowl dash with the side lamps set flush. The fenders closely follow the curves of the wheels and a complete equipment is furnished with the car at the inclusive figure.—King Motor Car Co., Detroit, Mich.

### Kissel Six Lengthens Wheelbase

Two new models have been announced by the Kissel company, the 6-60 and the 4-40. Both have been changed materially in a mechanical way, and the latter has a price reduction of \$150. These two new models and a 6-48, which was announced also this season, make up the entire line. This year left drive and center control will be featured on all models. Neither of the discontinued models which were known as the 4-30 and 4-50 have this feature.

On the 6-60, the most important change is the lengthening of the wheelbase from 140 to 142 inches. Outside of this octagonal, in place of circular, headlights are used and the bodies with their rounded fenders and clean running boards have been brought thoroughly up to date. Following general practice, pressure fuel feed is now used, the gasoline tank being placed in the rear, and the capacity increased from 20 to 24 gallons. The rear springs have been widened from 2.25 to 2.5 inches. The motor dimensions of the six have not been altered. The 4.5 by 5.25 power plant, with L-head cylinders cast in blocks of two are still retained, along with the chain-driven camshaft, dual ignition, Esterline system and Stromberg carbureter. Three dash lamps illuminate the instruments and the side lamps have been fitted with bull's eyes in the rear which illuminate the entire lengths of the running boards.

Fewer changes are on the four-cylinder model. The wheel diameters have been increased so that instead of 35 by 4.5 tires, 36 by 4 are used. The power plant of this model has its L-head cylinders cast in pairs and is a 4.5 by 5.25.—Kissel Motor Car Co., Hartford, Wis.

### Kline Making Four Models

The Kline Motor Car Corp. is making four 1914 models known as the 6-60, 6-50, 4-40 and 4-30. The first numeral designates the number of cylinders and the latter combination the horsepower. The 6-60 motor is a six-cylinder rated at 60 horsepower having the cylinder castings in pairs and bolted en bloc. The shape of the cylinders is T-head and the bore is 4.31 inches

with a stroke of 5.75 inches. The intake valve located on the left side of the motor and exhaust valve on the right. Both the intake and exhaust manifolds are cast separately. Both the motor and the transmission are suspended at three points, the latter having four forward speeds and being a separate unit. The clutch is in the flywheel and is of the cone type, leather-faced with cork inserts.

The lubricating system is a combination, forcefeed and splash, the main bearings receiving their oil under pressure while the overflow is scooped up by the connecting rods forming the splash. A flat-tube cellular radiator is used in conjunction with a centrifugal pump to form the water-cooling system. The gasoline system is gravity feed from a tank under the front seat to the carbureter, being regulated from the side of the car. Electric equipment consists of a Rushmore starting and lighting system (separate units) and a Bosch dual ignition system. The double wire system is used in lighting and the voltage at which the system operates is six. The steering wheel is located on the left side and the gearshift and emergency brake levers in the center. The gear reduction is 3.7 to 1 on third speed or direct, while the fourth speed is geared above direct giving a ratio of 2.69 to 1. The drive is through a bevel gear rear axle of the floating type. The wheelbase is 133 inches, the tread 56 inches and 37 by 5-inch tires are used all around in connection with Firestone detachable demountable rims.

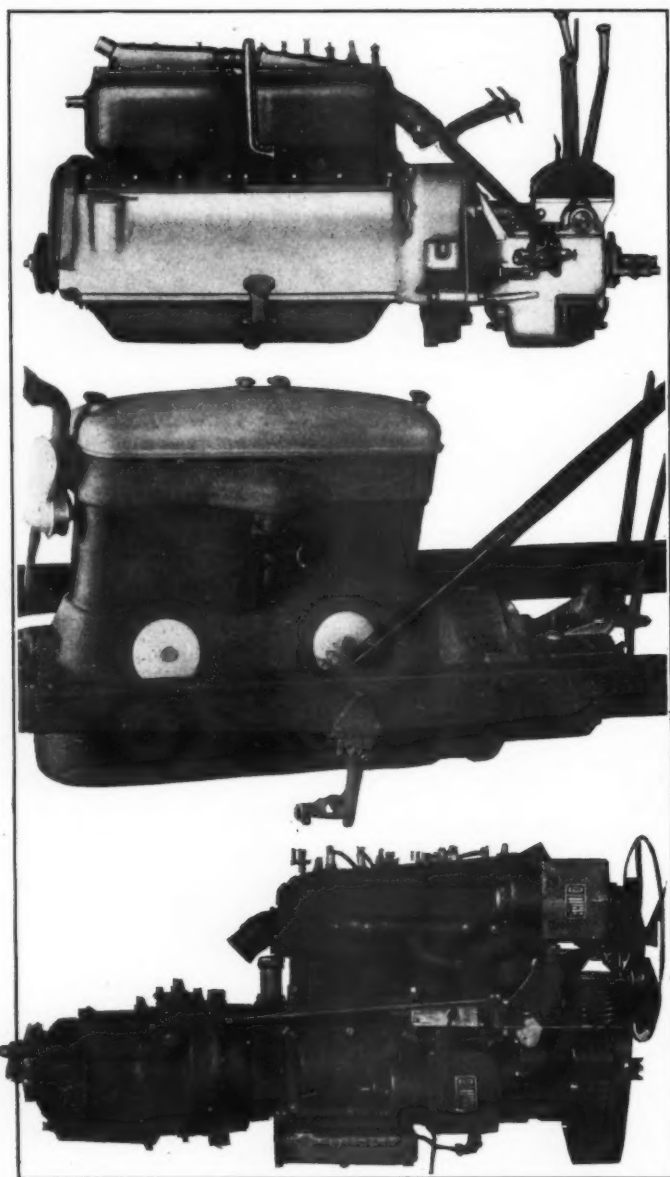
The other Kline motors are of the same type except the 4-30, the cylinders of the latter being cast separately, with inlet and exhaust manifold on the right side. The 4-30 is a 4 by 4.625, the 4-40 a 4.3 by 5.75, and the 6-50 a 4.125 by 5.5. All are lubricated by combination splash and pressure, have gravity-fed carbureters and Rushmore electric starting and lighting systems. Dual ignition is used on all but the 4-30 where two separate systems are employed. Other chassis details follow the description of the 6-60 above except that the 4-30 has right drive and right control. The wheelbase in the 4-30, 4-40 and 6-50 is 115 inches, 120 inches and 128 inches, respectively, and the line offers a selection from the following body types: Seven, five, four and two-passenger. The only closed car built is a two-passenger coupé roadster, which is turned out on the 4-40 chassis.—Kline Motor Car Corp., Richmond, Va.

### Knox Offers Optional Control

Four chassis are offered by the Knox Company for 1914, two fours, models 44 and 45, and two sixes, models 46 and 66. Electric lighting and starting has been added to all models. The two four-cylinder cars are the same except for wheelbase, gear ratio, tire size and steering. The motor of four cylinders with 5" bore and 5.5" stroke has separately cast cylinders and the valves in the head—Knox construction for some years past. Bosch double ignition and Stromberg carbureter are used. The running gear details consist of a disk clutch, three-speed selective gearset, a unit with the motor, driving to a floating rear axle. The 44 has a gear ratio of 3.3 to 1 with 122 inch wheelbase and 36 by 4.5 inch tires. The model 45 has a 3.3 to 1 gear ratio, a 126 inch wheelbase and 37 by 5 inch tires. Right steer and center gearshift control are used on the model 44, whereas the steer is optional and the control center on the model 45.

The two six-cylinder chassis are somewhat different. The model 46, unchanged for the coming season, has a bore and stroke of 4.38 by 5.5 respectively, with cylinders cast in pairs, the valves being in the head, Bosch double ignition and Scott carbureter are equipped as stock. The motor drive is through a disk clutch to a three speed selective gear set, thence to a floating rear axle, the gear ratio being 3 to 1; the wheelbase 134 inches and the tires 38 by 5 all around. Optional steer and center control are offered.

The big six, model 66, has a bore of 5 and a stroke of 5.5. Bosch double ignition with Stromberg carbureter are seen on this model. The clutch, gearset, wheelbase and rear axle are the same as in the little six. The gear ratio, however, is 3 to 1 and the tires 38 by 5.5 inch all around. The steer is optional with



Side views of three 1914 motors, Hudson, Premier and Paige, from top to bottom

center control. All Knox cars are equipped with the Berdon lighting and cranking system and have refined body types the coming year.—Knox Automobile Co., Springfield, Mass.

#### Krit Made in One Model

The entire Krit production is limited to a single four-cylinder chassis model on which two body types are fitted—a roadster and a touring car. This chassis is virtually the same as that of last year, but the bodies are new in design. They conform to the latest dictates of body fashions in that the ultra-streamline effect is carried out. A new shape of hood is also a part of the new outward appearance of the Krit, it being a sloping type with a rounded top to conform to the altered radiator design. A sloping cowl meets this sloping hood without break in the smooth lines, and carries back to the body proper. No side lights are fitted, the head lamps being so connected to the dash switches that either a dim or a bright glow may be had.

Along with this entirely new and refined body, the Krit this year is also fitted with a 10-gallon cowl gasoline tank to replace the former under-the-seat type. The reservoir has a 2-gallon reserve. This tank position allows the front seat to be set lower and a deeper cushion to be used; while due to its higher position, it makes a more positive gasoline feed, at the same time permitting the carburetor to be more accessibly placed higher up.

Although the new body types are the talking points of the Krit cars this year, the power plant has come in for some refinement, principally to make it a higher speed proposition along with a decrease in vibration. This has been accomplished by lessening the weight of the reciprocating parts. The maximum speed of the engine has been thus increased from 2,400 to 3,100 revolutions a minute. The greater weight has been clipped from the pistons, a total of 3.5 pounds being taken off of them.

The motor in general construction remains as in 1913. The cylinders are L-head, block-cast design with a bore of 3.69 inches and a stroke of 4 inches, giving about 25 horsepower normally. The gearset bolts to the back of the flywheel housing, making a three-point supported unit power plant; one frame support being at the front and two at the rear. Thermo-syphon cooling, splash lubrication, Bosch variable spark ignition are among the features. The latter variable ignition replaces the fixed spark type formerly used.

Although the price of the 1914 Krit is practically the same as last year at \$950 with full equipment, for \$100 additional a complete electric combination cranking and lighting system is supplied. When not equipped with this lighting system, the 100-ampere-hour Willard storage battery which is a part of the standard equipment furnishes current for the lights. Oil side and tail lights, gas headlights with Prest-O-Lite tank optional.

Chassis details include a torque tube inclosed propeller shaft with universal joint at the front end, semi-floating rear axle, underslung elliptic rear springs, left drive and control. None of these features is altered in the new cars. The wheelbase, however, has been lengthened by 2 inches to 108 inches.—Krit Motor Car Co., Detroit, Mich.

#### Lambert Has New Small Model

Lambert cars for the new year are featured by the appearance of a smaller and lighter model than any that has been marketed previously by the Buckeye Mfg. Co., Anderson, Ind. This is known as the model 42, the other chassis model is a continuation with some changes of the earlier product, and known as the model 60. The chief feature of Lambert construction is its friction drive or, as the maker chooses to call it, the gearless transmission, giving any number of speeds. It consists of a friction wheel in contact with a friction disk on the engine shaft. The shaft of the friction disk drives the rear axle through a Reynolds silent chain which is inclosed in an oil-tight housing.

The model 60 series C car is the larger one and has rather an innovation in that instead of making the motor an arbitrary feature of the car the Buckeye company makes it optional equipment; that is, either the Continental four-cylinder 4.125 by 5.25 motor may be used or the Rutenber four-cylinder 4.25 by 5.25. Such an option may be considered rather an added attraction to the purchaser in that it allows his personal whim to be gratified with reference to the engine.

As to the changes in the model 60, the body is made more roomy and luxurious, the fuel tank is carried under the cowl of the dash and all of the instruments placed on the cowl board and protected by an extended shroud. The windshield is of the ventilating type. The new car which has been brought out for this season is the model 46 and like the larger one is equipped with either Continental or Rutenber motor, the cylinder dimensions being 3.75 by 5.25. This car has left drive and center control and carries a locking feature on the emergency brake lever so that it can be locked on the street to prevent theft. The car is built very low, much lower than the usual friction-driven car.—Buckeye Mfg. Co., Anderson, Ind.

#### Lenox in a Four and Six

Two models, a four and a six, make up the Lenox line for this season. Both models have their gearboxes mounted as a unit with the rear axle and the Gray and Davis lighting and starting system is used in connection with each.

The four-cylinder motor has a L-head cylinder casting in which all the cylinders are cast together in a single block. The bore of this motor is 4.25 inches and the stroke is 5.5 inches. The



makers rating for this motor is 40 horsepower. The motor is water-cooled, this function being aided by a honeycomb type of radiator. Single magneto ignition is used, the current being furnished by an Eisemann high-tension instrument as it is figured that the electric cranking motor will spin the engine fast enough to obviate the necessity of a battery system for starting. A cone clutch faced with leather is housed within the flywheel and the rear-axle gearset provides a range of three forward speeds and a reverse. Left steering and center control is fitted, the emergency brake lever being to the right of the gearshift lever and controlling an internal brake having a drum diameter of 12 inches and a face width of 2.25 inches. The service brake is also internal and has a diameter of 16 inches and a face width of 2.5 inches. The wheelbase is 118 inches.

The six-cylinder car has a bore of 4 inches and a stroke of 5 inches. It is rated by the makers at 60 horsepower and has its cylinders cast in threes. The general features of this car, outside the motor and its greater size, do not vary much from the four-cylinder. The Eisemann single ignition is used and the Lenox carbureter and three-quarter floating axle. The wheelbase of the six is 130 inches.—Lenox Motor Car Co., Boston, Mass.

### Lewis a Six-Passenger Car

Among the latest of the new comers to the motor car field is the new Lewis car. It appears only as a six-passenger light six-cylinder car listing at \$1,600. The motor is unique in that it is a block casting of unusually long stroke, the cylinder dimensions being 3.5 bore and 6 inches stroke. The cylinders are of the L-head type with the camshaft driven by silent chain. Lubrication is of the pure splash type, the level maintained by the flywheel. A multiple disk clutch, together with the three-speed selective gearset, form a unit with the motor. The rear axle is floating and left drive and center control are fitted. The wheelbase is 135 inches, the tires are 36 by 4.

Electric lighting and cranking system forms a part of the equipment, as do the Jiffy curtains. A rather unusual economy is claimed for the car as it is said 15 miles per gallon of gasoline is the consumption.—L. P. C. Motor Co., Racine, Wis.

### Locomobile Offers Left or Right Drive

Four chassis make up the Locomobile line for 1914. Two of them are left drive and two right drive. No four-cylinder models are made by the Locomobile company this year, all four chassis being sixes. The four chassis divided themselves naturally into pairs. Two have left drive and two right drive. They are known as the 38 left drive and 38 right drive, the 48 left drive and 48 right drive.

Few changes of a mechanical nature have been made in the car and what have been made are chiefly due to the new position of the steering wheel on the left side of the car. In both the 38 and 48 the wheelbase of the left drive car is 4 inches longer than that of the right drive. On the left drive cars the wheelbase for the 38 is 128 inches and for the 48 140 inches.

A novel scheme in the controlling mechanism for the Locomobile is the placing of the gearshift close against the front seat in the center of the car and the emergency brake on the left. An improved carbureter will be found on the 1914 Locomobile, the needle valve construction governing the admission of gasoline having been changed.

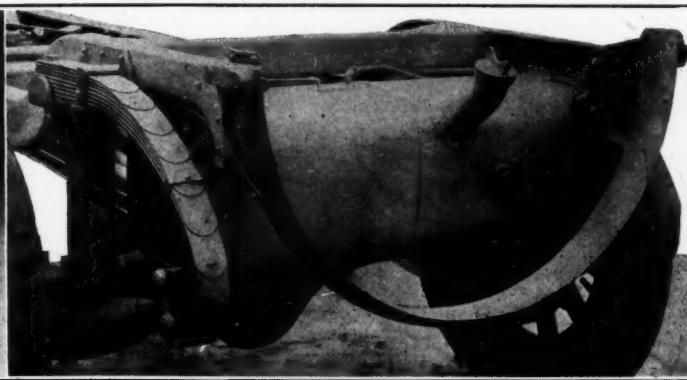
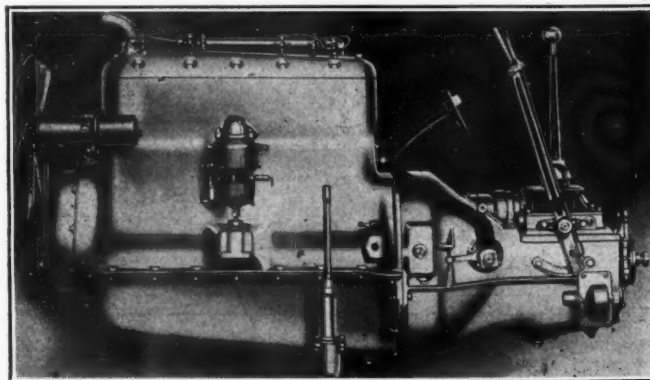
Another feature in connection with the carbureter is the mounting of an air control device directly under the steering wheel. The gasoline is fed to the carbureter on the left drive models by pressure and on the right drive models by gravity. The electric motor starter equipment which was introduced in 1913 has been continued without change. The trend toward improvement in body design which has been noted all over the country is exemplified in the Locomobile types which have been rendered distinctive by modified use of the streamline, and in a detailed way by using rivetless fenders, etc. Many conveniences will be found on the car in the line of up-to-date accessories which besides the usual equipment include exceptionally rigid tire carrier in the rear, a single cylinder air pump which can inflate a tire to 90 pounds in 2 minutes and rigid lamp, and license bracket fastenings which make for silence.—Locomobile Co. of America, Bridgeport, Conn.

### Lozier Making Fours Again

Though the Lozier Company had no four-cylinder cars on the market for the past year, concentrating its efforts on a big six-cylinder car and a light six, it has now discontinued the production of this larger six in order to give over its whole facilities and attention to producing a light six, a four-cylinder car which with many advanced features of construction marks the entry of the Lozier Company into the medium price field and its return to the making of four-cylinder models. It is to sell for \$2,100 with full equipment. The motor in particular is remarkably simple in outward appearance. Specially noteworthy in this respect is the left side, on which the carbureter is the only external fixture. The stroke of this engine is exceptionally long—6.5 inches, while the bore is 4.25 inches, giving a ratio of 1.53 and a piston displacement of 533.8 cubic inches.

The intake opening, being on the opposite side from the valves, the passages run between the cylinders within the casting to the valve side. The exhaust manifold, however, is external, having an opening into each cylinder. The pressure system of lubrication is employed with the flywheel acting as a centrifugal pump. Mechanical water circulation with centrifugal pump is used, while gasoline is fed by pressure from a tank at the rear of the chassis. The Gray and Davis lighting and cranking system is used, the motor and generator being separate and mounted on the right side of the gearcase, they drive through silent chains to the clutch shaft.

The gearset affords four speeds forward, and the power goes to the rear through an uninclosed propeller shaft, to the floating rear axle. The wheelbase is 120 inches, and besides the usual equipment, a power tire pump is furnished which is inbuilt into the motor, being on the magneto and pump shaft.



Lozier four-cylinder motor, Marmon pressure tank and tire carrier

The Lozier light six has a motor 3.875 by 5.5 cylinders which are cast in threes and of the L-head type. The motor develops 62 horsepower, and any changes which have been made in it are in the nature of refinements tending towards greater silence. Cloth timing gears in place of the old steel-against-steel variety is a big step towards an absolutely silent design.

Though the 1913 Lozier light six was 500 pounds lighter than any car the Lozier company had ever produced, the new series appears still lighter by 300 pounds. A big factor toward eliminating needless weight is the new Lozier feature of direct drive through the rear springs, the radius rods and strut rods have been done away with in favor of this more flexible construction.

The light six has a wheelbase of 127.5 inches, is equipped with a Gray and Davis electric lighting and cranking system of two units mounted on the right side of the motor and also has a power driven tire pump. Its rear axle is floating, the clutch is a multiple disk type, the gearset gives three forward speeds and the rear spring suspension is of the platform type. Left drive and center control are also used. The equipment leaves nothing to be desired. Tires are 36 by 4.5.—Lozier Motor Co., Detroit, Mich.

### Luverne a Thermo-Syphon Six

The Luverne Company is offering the 7-60, a six-cylinder thermo-syphon cooled car, for the coming year with a number of essential changes. The motor's dimensions have been increased from 3.75 by 5 inches to 4 by 5 inches and the wheelbase decreased from 130 to 128. The tires have been made smaller, due to the decrease in weight of the car. The new Luverne will appear with 36 by 4½-inch tires all around, against 37 by 5 in the previous model. A price reduction of \$350 is to be noted, the new figure being \$2,500 for the single seven-passenger model offered. The Kellogg air starter is in addition to the equipment and the lighting is by Vesta generator, with the lamps so arranged that they may be used for both acetylene and electricity. The body design has been changed slightly, allowing for a continuous leather roll along the top edge of the body sides. The distinctive features of Luverne cars, such as double running boards, Spanish brown leather and brown finish, remain unchanged.

This year will see the big brown Luverne with left drive and center control as formerly, a disk clutch driving through a selective gearset to a floating axle. The double step feature mentioned above not only adds to the appearance of the car, but affords a means of obtaining clean running boards. The upper step is hollow and is used as a tool box, the battery being placed under the floor boards and the extra tires at the rear.

The Luverne six motor remains unchanged in design, the cylinders being as before of L-head construction cast in pairs with all the valves on the left side. The camshaft is driven by helical gear, lubrication by splash with an auxiliary pump to supplant any deficiency, ignition by dual system and fuel feed by gravity, the tank being located under the front seat.—Luverne Automobile Co., Luverne, Minn.

### Lyons-Knight a New Sleeve Car

Heretofore a builder of motors only, the Lyons-Atlas Company, which succeeded the Atlas Engine Works, of Indianapolis, has taken to car building, using the Knight motor for which it holds the manufacturing license. This new car carries the title of model K and appears in touring, sedan and Berlin bodies and using only a four-cylinder motor, 4.5 by 5.5. Only one chassis is on the market at the present time, that carrying 138-inch wheelbase.

The Atlas-Knight motor differs from other Knights in that the sleeve eccentric rods which pumps oil from the reservoir under-sealing of the ports and giving added increase in power. The walls of the sleeves have been made thicker than is customary, but fillets made larger, and the lugs at the bottom made stronger. The inlet ports of the motor are arranged so that the shortest possible carburetor manifold is required, with a view to eliminating fuel condensation and also making the carburetor more ac-

cessible. With the idea of reducing back pressure in the cylinders, the exhaust manifold has been made 3 inches in diameter at the connection to the cylinder.

The oiling consists of a plunger pump, operated by one of the sleeve eccentric rods which pumps oil from the reservoir underneath the crankcase to the different bearings of the motor. Before returning to the pump for recirculating, the oil is strained. Other features are double ignition, a double-jet carburetor, a three-plate clutch, and a floating axle. The Atlas pins its faith to left drive, center control, and also utilizes worm drive and a hydraulic shock absorber which is attached to the worm gear casing from the center of the rear frame member. The car is electrically started and lighted, the North East system being used. Strong emphasis is placed on the equipment, which includes a one-man top, windshield, dust covers, accommodation speedometer and clock, tire holders, two demountable rims, trunk racks, etc.—Lyons-Atlas Co., Indianapolis, Ind.

### Marathon Continues Three Models

The Marathon line is continued for 1914 in three models of much the same nature as the 1913 offering. These chassis sizes are styled models Champion, Winner and Runner, respectively, the corresponding horsepowers being 45, 35 and 25. However, the prices have been reduced, ranging now from \$1,495 to \$925, as compared to last year, when the Champion was listed at \$1,750.

The motor sizes of the Champion are 4.5 by 5.125, of the Winner 4.25 by 4.5, and of the Runner 3.5 by 4.5. The motors are all L-head designs and unit, with the transmission and joint, including the multiple-disk clutches running in oil within the fly-wheel. Valves and valve rods are accessibly shut off from outside by removable side plates. Three-speed gearsets with 4 to 1 ratios on direct are used throughout, and the two larger chassis have floating axles, while three-quarter floating axles are used on the Runner model. The wheelbases are 123, 118 and 106 respectively, and tire equipment is 36 by 4, 34 by 4 and 32 by 3.5.—Marathon Motor Works, Nashville, Tenn.

### Marion Adds a Six—Continues Four

The 1914 season marks the conversion of the Marion to the six-cylinder field. Although the six has been marketed since August of last year it is a 1914 production. The four-cylinder model is also continued. The new car is known as the Marion G and comes in five body types fitted to the same chassis. These are a five-passenger touring car, two passenger foredoor roadster and Bobcat speedster as well as a four-passenger coupe and a five-passenger sedan.

Another innovation for the Marion company is adoption of the left drive in connection with the center control. The latter has been a Marion feature for some time. The clutch of the six also marks a departure from former Marion practice in that the earlier clutches were of the cone type. The present one is of multiple disk design with raybestos and steel facings.

The six-cylinder is the Continental L-head type with cylinders cast in threes. They have a bore of 3.75 and a stroke of 5. Elimination of the conventional breather pipe is provided by allowing the crankcase compression to escape through openings into the valve mechanism pocket in the cylinder castings. Breather holes in the valve cover plates relieve pressure in these pockets. Among the features of the ignition system is the use of a special type of adjustable coupling in the shaft between the magneto and the driving wheel. This is arranged so that the spark timing may be altered through a range of 2 degrees without having to reset the gears.

Gasoline is fed to the carburetor by pressure by a small pump operated from the camshaft. Electric cranking and lighting equipment is by the Westinghouse system. A novelty in the way of horn mounting is found in the Marion six in which the electric horn is carried on a special bracket attached to the steering column and under the hood.

Two changes in the four are worthy of note. They are a larger cone clutch and a floating axle of the flange type. Four



body types are fitted to the four: a five-passenger touring car, two-passenger roadster, Bobcat speedster and a four-passenger coupé.—Marion Motor Car Co., Indianapolis, Ind.

### Marmon Featured by New Six

Nordyke & Marmon productions for the new season are featured by the addition of a new six-cylinder chassis known as model 41, which, though hardly a light six, is considerably smaller than the former 6-48, which is continued. It comes midway in the point of size between that and the four-cylinder Marmon 32, which likewise is retained as part of the line. The new Marmon 41 departs in numerous particulars from previous practice at this Indianapolis plant. The six cylinders are 4.25 by 5.5 inches and are of the L-head type cast in two blocks of three. Former productions have adhered to the T-head pair-casting construction. Likewise at the rear end there is a difference over earlier chassis in that the new axle is floating whereas former ones are semi-floating and carry the gearset as a unit. In the 41 the gearset is amidships.

There are a number of the refinements in the motor, the chief of which is the lubrication of the valve mechanism. As has been the rule in Marmon engines, pressure oiling is employed, the oil being fed to all the crankshaft and connecting-rod bearings through holes in the crankshaft and likewise carried upward to the wristpin by a tube brazed upon the connecting-rod. In the new motor this arrangement is carried still further, the camshaft is inclosed in a separate chamber and runs submerged in oil. The valve tappets and adjusting screws are drilled out so that the oil can work to the point of contact with the valve stem, thus forming an oil cushion at this point. This effectually deadens the noise and materially reduces the wear. The camshaft is driven by helical gears and the magneto and water pump are driven by silent chain from the forward end of the crankshaft, a double universal being provided for driving the magneto. A Noil tire pump is driven from the magneto universal. The motor is supported upon three points. The clutch is of the cone type and a form of plain release is used which gives a satisfactory braking on the clutch, dispensing with separate devices for this purpose. The gearset has three speeds and the drive from the latter to the rear axle is through universals and exposed shaft using a separate torque member for absorbing the driving and braking torque. The spring eyes are graphite bushings which are self-lubricating and the springs themselves are self-lubricating in that the leaves are formed with little pockets which carry graphite sufficient to lubricate the springs throughout their life. The electrical equipment consists of the Northeast cranking and lighting system. Bodies on the new 41 have a low streamline effect and the running boards are clean, the full length of the body proper, though there is a large box just back of the fender on either side, one for tool equipment and one for luggage. These do not alter the symmetrical appearance of the car.

This new model appears as a roadster, four-passenger and five-passenger touring and a limousine and a landaulet. Though the prices are not announced as yet they will fall somewhere between those of similar bodies on the two older models which are described below.

The two older models, the 4-32 and the 6-48 are continued with only detailed refinements. The 4-32 has a 4 1-2 by 5 inch motor, has a cone clutch and a wheelbase of 120 inches, tires are 35 by 4 1-2 inches in size. The bodies fitted to the four-cylinder chassis include a roadster at \$2,900, four and five-passenger touring at \$3,000, a seven-passenger touring at \$3,125, a seven-passenger limousine at \$4,000 and a three-passenger landaulet at \$4,100.

The 6-48 has 4 1-2 by 6-inch cylinders of the T-head type cast in pairs. The gearset is on the rear axle which is semi-floating. Wheels are 145 inches between centers and tires are 36 by 4 1-2 inches in front and 37 by 5 in the rear. The bodies on the 6-48 include a three-passenger roadster, and four-, five- and seven-passenger cars at \$5,000 with a landaulet and a

limousine at \$6,350 and \$6,450 respectively. The prices on both of those models are practically the same as those last year.—Nordyke and Marmon Co., Indianapolis, Ind.

### Mason Making Long-Stroke Four

One regular model and two others which will be built on order constitutes the Mason line for this year. The regular model is a four-cylinder having a 3.875 by 5 Duesenberg motor included in a 116-inch chassis upon which is mounted a steel-covered touring body. On special order the speedster type of body will be made and also by special request the two-cylinder design, a hold-over product will be made up.

Typical of the Mason power plant are the block cylinders, a two-bearing crankshaft, valves placed horizontally in the head, thermo-syphon cooling and Splittorf dual ignition. Starting and lighting by electricity is not regularly included but if the purchaser desires, he can have it for \$200.

The chassis running gear includes a multiple-disk clutch, three-speed sliding selective gearset, Timken front and rear axles and emergency and service brakes on the rear wheel drums. The car is sold at an inclusive figure. If electric lights are not purchased an acetylene tank is furnished.—Mason Motor Co., Maytag Station, Waterloo, Ind.

### Maxwell Has Two Fours and a Six

The Maxwells are in three models—a 25 four-cylinder car; a "35" four-cylinder and a six-cylinder. Having gone through its reorganization period, the Maxwell Company several months ago started in earnest to make these cars in large numbers, the greatest quantity production being that of the small four model 25.

This model 25 has a block-cast motor with the upper half of the crankcase cast integral. The size is 3.625 by 4.5. This engine has a detachable cylinder head which carries the spark plugs, priming cocks and water outlet connection. Ignition is by means of a Simms magneto which can be locked from the dash, lubrication is by the splash system with a positive oil pump and cooling employs a thermo-syphon system with tubular radiator.

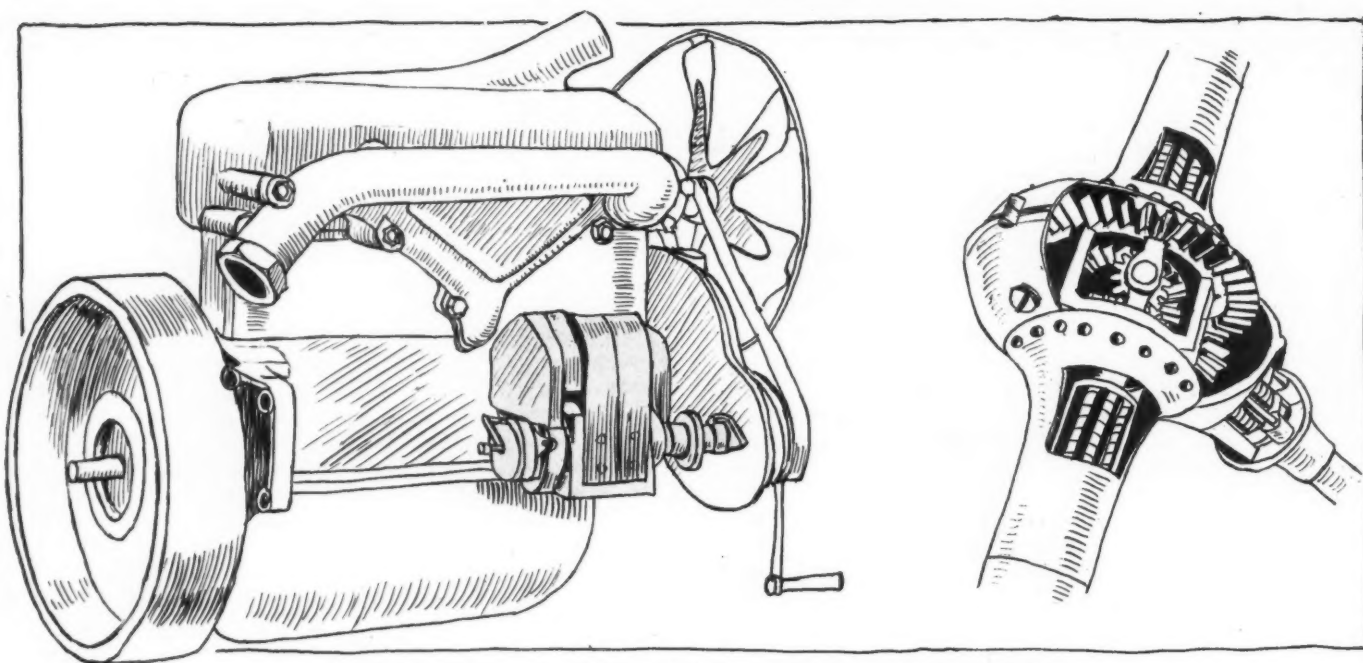
The gearset bolts to the rear of the crankcase and is of three speed selective type. The clutch is of the cone variety lined with a friction material. The springs are half elliptic front and rear, the latter being attached to spring horns at their rear ends. The rear axle is three-quarter floating and gets its power through an inclosed drive shaft which has a universal joint in front.

The wheelbase of the 25 is 103 inches; it has left steer and center control; carries 30 by 3.5 inch tires and weighs 1,650 pounds.

Like the 25, the model 35 motor is a block casting with the upper half of the crankcase integral with the cylinders. It is a 4 by 4.75 with valves all on the left. But unlike the smaller motor, this one does not embody the unit power plant feature, the gear box being back in unit with the rear axle instead. The flywheel is uninclosed and has teeth cut in its periphery with which the electric motor gear engages for cranking purposes, the car being equipped with electric cranking and lighting as a standard feature. Both intake and exhaust manifolds on this engine are cast integrally making a very smooth outward appearance to the assembly. The crankshaft has three main bearings; Splittorf dual ignition is used; lubrication is by splash and cooling is mechanically provided for by the use of a centrifugal pump. The Holley carbureter gets its fuel by gravity.

The car has left drive and center control. The torsion tube inclosing the propeller shaft has a hinged yoke at its front end, and here also is the universal joint. Between the tube and the axle housing, the three-speed gear is mounted compactly, while radius rods run from the front of the torsion tube to the ends of the rear axle. Three quarter elliptic rear springs are used and brakes are conventional. The wheelbase of this model 35 is 111 inches, and the car is fitted with 33 by 4 inch tires. The car weighs 2,750 pounds, and comes in roadster design besides the five-passenger touring.

The big car of the Maxwell line—the 50-6—has much in com-



Maxwell 25 motor, new on the market this year, Ford model T rear system

mon with the model 35 so far as mechanical design is concerned. The motor is cast with cylinders in a block, the dimensions being 4.125 by 4 3-4. This car is being brought out with optional right or left hand drive. In the left hand driven car the valves are on the right side, while in the right hand driven car the valves are on the left side. Exhaust manifold is cast integral with the cylinder block.

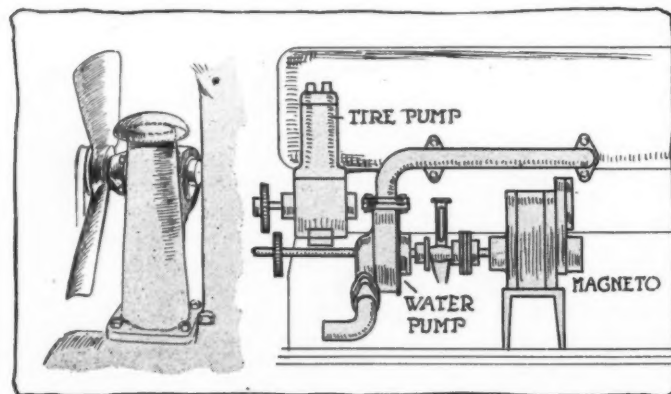
The wheelbase of the 50-6 is 130 inches, the tires are 36 by 4 1-5 inches.—Maxwell Motor Co., Detroit, Mich.

### McFarlan Putting Out a Six

One model, a six cylinder, will constitute the McFarlan line for the 1914 season. This company is using left drive, a 128-inch wheelbase instead of 124 inches, three-quarter elliptic springs instead of elliptic in the rear of the car, the radiator is now supported on trunnions instead of plain bolts and several minor changes of a mechanical nature have been made.

The tank construction used in the 1914 product is better than last year in that seamless steel is used for the gasoline tank and the air tank for the starter is larger. An all-metal air pump has been added and the ball bearing steering knuckles have been eliminated.

The motor used in this car is a six-cylinder block type. The cylinders are T-head and have a bore of 4 inches and a stroke of 6 inches. The 2-inch crankshaft is carried on four main bearings the lengths of which are 4.5 inches at the ends of the crankshafts and 1.875 inches in the center.



Moline-Knight oil filler and fan, National water pump, tire pump and magnetic drives

A decidedly compact appearance is given to the motor owing to its short overall length and the fact that the valves are inclosed by a plate which extends the entire length of the casting. Two other features worthy of note in the valve action are the width of the valve ports which are 2.25 inches in diameter and the length of the valve guides which measure 3.75 inches from top to bottom.

Ignition current is furnished by a Mea magneto and current for lighting is produced by a Deaco electric generator which stores a Vesta storage battery. The starting system used on this car is a pneumatic type of the same design as has been in use on McFarlan cars for the past 3 years. An improvement for this year in the starting system is the four-cylinder all-metal pump which can keep the 10 by 40-inch seamless steel tank filled to a pressure of from 250 to 300 pounds to the square inch.—McFarlan Motor Car Co., Connersville, Ind.

### Mercer Adds New Touring Car

Two new four-cylinder models have been added to the Mercer line for 1914, one is a five-passenger touring car mounted on a 124-inch chassis, and the other a large runabout mounted on a 118-inch chassis. These are known as models M and O respectively. The small model K runabout has been discontinued, the larger runabout taking its place. The model J raceabout which has been a well-known Mercer type since 1910 has been continued, and model H a close-coupled five-passenger touring car will also be continued. The motor remains unchanged, the raceabout being fitted with a 4.375 by 5 inch engine and the other models having a 4.5 by 5-inch. The S. A. E. ratings of these two motors are respectively 30.6 and 32.4, although the makers require that each should show a dynamometer pull of 58 horsepower at 1,700 revolutions per minute. This high horsepower has been secured by using cams of exceptionally steep contour, and by valve diameters of 2.25 inches. The valve lift is 7-16 inch. The motors have T-head cylinders with the intake on the right and exhaust on the left. The valves are not inclosed on any of the Mercer models.

The pistons have but two rings and H-section connecting rods are used with the H turned in the opposite direction from that generally employed. The crankshaft is carried on three large plain bearings, the lengths being respectively from front to rear 3.5, 3 and 4 inches. The diameter of the crankshaft is 2 inches. Rushmore lighting and cranking is employed and the ignition current is furnished by a two-point Bosch magneto with two sets of plugs firing simultaneously. The raceabout model has no



electric lighting and starting system but carries an acetylene tank instead.—Mercer Automobile Co., Trenton, N. J.

### Meteor—Two Fours and a Six

Among the cars which make their first appearance on the American market is the Meteor, built by the Meteor Motor Car Co., Shelbyville, Ind. It is marketed regularly as a five-passenger touring car in three different sizes. These three sizes are known as the M-36, F-40 and the W-6-45. The two smaller ones have the same motor, a four-cylinder Beaver engine of 4 by 5. This motor has the valves on one side with the cylinders cast in pairs. A combination of splash and pressure oiling is provided by gear pump.

The chassis of the two are alike in every respect except that of wheelbase, which in the case of the M-36 is 116 inches and on the F-40 is 118 inches. There is a slight difference in the ignition, the smaller one using the Remy magneto, while the larger one uses an Atwater Kent distributor. The chassis layout of the two four-cylinder cars involves a multiple-disk clutch and a three-speed gearset in unit with the motor, a three-quarter floating rear axle, 34 by 3.5-inch tires and center control with right drive. Jesco electric lighting and starting system is installed at an extra cost of \$125 on the M-36, while it is stock equipment on the F-40. An electric horn is stock equipment on both models. The M-36 lists at \$950 and the F-40 at \$1,275.

The six-cylinder car likewise has a 3.75 by 5 Beaver motor. In other respects the car is the same as the 40-horsepower creation, except for wheelbase and tire size, the former being 122 inches and the tires 34 by 4. It lists at \$1,600.—Meteor Motor Car Co., Shelbyville, Ind.

### Metropol a New Car This Year

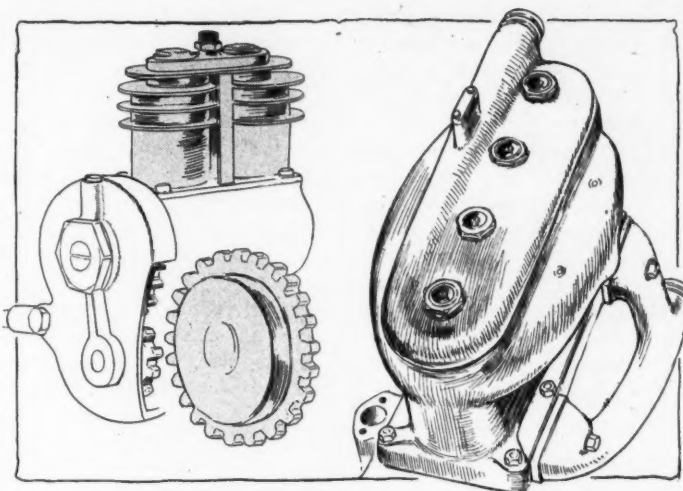
The Metropol is a new car. It is interesting because it is the only 90-horsepower car selling below \$1,500, and because the construction of its chassis is such that several parts are eliminated. The motor has an exceptionally long stroke, the bore being 4.25 and the stroke 7.875 inches. The S. A. E. rating of this motor is 29 horsepower, but the makers state that the actual horsepower developed is in excess of 90. The chassis is distinguished by the fact that it is a unit construction as far back as the rear end of the gearset which is mounted amidships. The crankcase flange has been extended until it forms a broad shelf which is rigidly connected to the side frame members. The gearbox is also solidly connected to the side frame and abuts at the rear against a solid bulkhead. There is no universal joint between the clutch and the gearset and the solid construction up to this point does away with the universal joint at the rear end of the driveshaft. A three-speed gearset furnishing a ratio of 2.5 to 1 on direct is furnished and semi-elliptic springs are used both front and rear. The control features are standard and mounted on the right side.—Metropol Motors Corp., Port Jefferson, N. Y.

### Metz Cuts Runabout Price 10 Per Cent.

With a price reduction of \$20 under the 1913 figure the friction-driven Metz 22 offered by the Metz Co., Waltham, Mass., at \$475 for 1914 appears with only slight changes mechanically, the efforts of the manufacturer being centered about body style. As against former practice this car now appears with the torpedo rear end or with the rear end that will accommodate a rumble seat. The four cylinder of 3.75 by 4 inches cast en bloc with splash lubrication, single ignition and gravity fuel feed constitute the power plant. The friction drive, long a feature of Metz cars is adhered to, the final drive from the jack-shaft to the rear wheels being by chain. The wheelbase is 90 inches, tires 30 by 3 and the drive left and control center.—Metz Co., Waltham, Mass.

### Mitchell Making Three Chassis

Three chassis, two sixes and a four make up the Mitchell line for 1914. A number of important details have been made this year, although the distinctive features of Mitchell design have

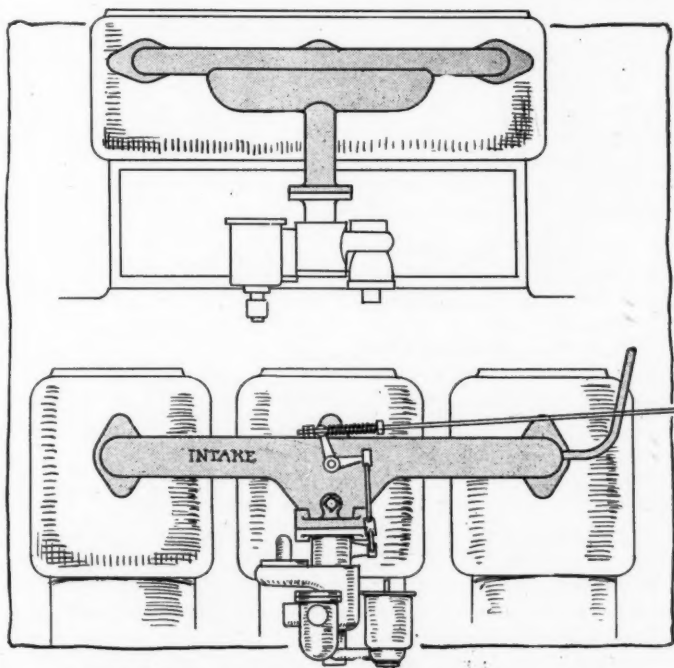


Moline air pump and top view of the Moline motor

been maintained. The same three chassis as last year will be continued, but a modification of the European design used last year has been made to render the cars more suitable to American practice and American roads. The 4.25 by 7-inch four-cylinder car carries a two, four and five-passenger body. The Little Six with its 4.25 by 6-inch motor has a wheelbase of 132 inches and carries the same bodies as the four. The big six with its 4.25 by 7-inch motor and 144-inch wheelbase carries a seven-passenger body only.

The general features of all these chassis are alike, the motors are of the same design, having T-head cylinders cast in pairs. Power plants are carried on a sub-frame and are supported at three points. The design includes a cone clutch, a very strong frame, braced by three wide cross-members near its center, a massive ball thrust mounting at the front end of the torsion tube, a floating rear axle and seven-eighth elliptic spring. Left drive and center control.

Although this design is similar in all respects to last year the following changes as regards detail are included. The valve chambers are shallower, so that they are now closed by curve instead of by flat steel cover plates. The push rod adjustments are more accessible and the construction throughout the motor has been lightened to the extent of 200 pounds, while not detracting from its strength. The six-cylinder is now supported by six



Form of intake on Jeffrey six. Locomobile intake manifold

arms which are cast as part of the crankcase and rest upon a U-shaped channel subframe. The valves are all interchangeable and in general owing to the improvements, the motor is faster and more powerful than last year. The timing gear case has been redesigned completely and the gears are now cut with helical teeth. Eccentric bearings on the camshaft, generator shaft and magneto shaft provide for wear between the gears. An endless canvas belt surplants the gears for fan drive.

Remy cranking and lighting is used, the cranking motor being geared to the engine at a ratio of 25 to 1. The cone clutch is now a steel stamping in place of the previous aluminum casting. The gearshafts are now squared instead of splined, and the members of the frame which support the gearbox are curved upward instead of downward allowing the whole gearbox to be dropped without removing the body.—Mitchell-Lewis Motor Co., Racine, Wis.

### Moline Adopts Knight Motor

Moline has cast its lot with the sleeve valve motor and now produces cars equipped with the Knight motor. But one model is offered, a combination touring car which provides facilities for five or seven passengers. The car is particularly noticeable for the fact that it is the lowest priced vehicle which has so far been put out with the Knight motor. It sells for \$2,400.

The power plant is ample in size being a 4 by 6 motor. It is the only American Knight motor which has all its cylinders cast in one block and is throughout a unique design, tubular connecting rods being an instance. Besides this distinguishing feature it is the only Knight motor which has yet been built with thermo-syphon cooling.

Coincidentally with the adoption of the Knight motor the name dreadnought has been discarded and in the place of the old nameplate a figure of Sir Galahad appears. The bodies are of European cast appearing in streamline form with an unbroken line from the front of the car to the rear.

A specially designed Wagner electric lighting and starting system having the cranking motor and the generator in separate units is fitted and the generator is driven by silent chain.

Outside of the addition of the Knight motor the Moline chassis remains without change of note. The elliptic rear springs have been abandoned at the rear for underslung semi-elliptics, floating axle is retained and the brakes are on the rear wheels. The fuel tank has been removed from the cowl to the rear of the chassis.—Moline Automobile Co., Moline, Ill.

### Monarch Radiator under Hood

The Monarch Motor Car Co., which was formed in Detroit last summer, is making for this year a four-cylinder touring car which departs from the conventional in having a sloping hood under which the radiator is placed. Though in front of the motor, this cooling device is concealed, its filler cap only protruding through the bonnet. This sloping hood together with the streamline body design makes a very distinctive-looking whole.

In accord with many other manufacturers, the Monarch concern enters its car in the lists with a cowl gasoline tank, allowing the carburetor to be placed higher on the motor and thus shortening up the intake pipe with the advantage of reducing condensation.

The motor is designed to give 25 horsepower with dimensions of 3.75 by 4.25 inches. The cylinders are cast in pairs. Cooling is by thermo-syphon, while combination force feed and splash lubrication is employed, the circulation of the lubricant being maintained by a cam-operated pump.

Motor and gearset are in unit. A multiple disc clutch is used and from it the power goes to the three-speed gearset. A propeller shaft is the intermediary between power plant and rear axle. This propeller shaft is fitted with a universal joint at either end. The rear axle is semi-floating and its alignment is maintained by radius rods near either end. The rear springs are elliptic and underslung from the axle.

Left drive and center control are featured, and in general the

design adheres to latest American practice. The wheelbase is 110 inches.—Monarch Motor Car Co., Detroit, Mich.

### Moon Makes Two Chassis

Two chassis will be offered by the Moon company for 1914, a four and a six. The former known as the 4-42, and the latter as the 6-50. The six is entirely new and the four a carried over motor with numerous changes. The four-cylinder 39 and the six-cylinder 65 of 1913 have been discontinued. The new six has 129-inch wheelbase and has a very pleasing appearance with its sloping hood and flush-sided body. A Continental motor of 3.75 by 5.25 inches is used on the six. Cranking, lighting and ignition is by the Delco system. The drive from the motor is through a disk-clutch to a four-speed selective gearset and thence to a floating rear axle. The cowl dash is another feature of 1914 Moons, all the instruments being within arm's reach of the driver. Six body designs are offered, the five-passenger touring being listed at \$2,150. All cars have clean running boards, obtained by placing the battery behind the apron, and the tools under the front seat.

On the four the Delco system is now fitted. The exhaust is now on the right side and the intake on the left, which is opposite from 1913. The water pump has been changed from the left to the right side.

An auxiliary fan is used for 1914, the previous models used only the flywheel fan. The wheelbase has been shortened from 121 inches to 118 inches, and the "H" plate of the three-speed gearset changed so that the shifting is now done differently than in 1913. All wheels are now equipped with roller bearings, imported balls being featured last year. The absence of dash lights on all but the five-passenger is featured. The headlights are equipped with an extra small bulb, which is to be used for city work.—Moon Motor Car Co., St. Louis, Mo.

### Morse Reduces Its Price

Price reduction is the main talking point of the new Morse, the list having been dropped from \$4,200 to \$3,600 while a novelty is a 3-year guarantee, coupled with an agreement to have a company inspector examine the car at least once in 90 days, and to give each car a thorough overhauling once a year. During the time the owner's car is in the shops, the company will loan a machine for use while the overhauling is being done.

Mechanically, the Morse remains a four-cylinder production with 4.625 by 5-inch cylinders of the I-head type. The Gray and Davis lighting and starting system is employed.—Easton Machine Co., So. Easton, Mass.

### Moyer Adds a New Six

A new six-cylinder car is the leader of the present Moyer line. There are no radical changes in the general construction of this car over the 1913 design except that a new front axle has been incorporated. This has been designed to secure good steering qualities, the axle being made to give the steering knuckles an angle so that a straight line through the center of the king bolt will strike the ground at the point of tangency of the tire with the ground in about the center of the tire. This produces a caster effect and secures a balance for the front wheels that keeps them in a straight line with the car and gives the driver perfect control with practically no effort. It renders the transmission of road shocks to the steering wheel impossible and lessens the wear on the connections. In reconstructing this steering gear the king bolts have been made with 3.5 per cent. nickel steel, hardened, ground and lapped. They are 7-8-inch in diameter and there is a hardened 3.5 per cent. nickel steel bushing in the top and bottom portions of the axle forks and a thrust ball bearing in the top of the knuckle. The six-cylinder model, which is new for this season, is a seven-passenger touring car equipped with a Moyer 4.5 by 5-inch T-head motor suspended at three points in the chassis. It incorporates the U. S. L. electric starting and lighting systems, has a cone clutch, full floating rear axle and a three-speed selective gearbox. The brakes are both



internal expanding acting on separate drums and the car has right drive and control. Fully equipped it weighs 3,500 pounds without water or gasoline. The wheelbase is 135 inches, and the tires 35 by 4.5 inches.

The four-cylinder model, which has been continued over, is a five-passenger touring car equipped with a Moyer 4.5 by 5-inch T-head motor embodying the three-point suspension feature and a U. S. L. electric starting and lighting system. This car has 120-inch wheelbase, 34 by 4-inch tires, cone clutch, floating rear axle, right drive and control, three-speed gearbox and weighs completely equipped 3,100 pounds without water or gasoline.—H. A. Moyer, Syracuse, N. Y.

#### National Enters a Six

This year marks the entry of the National into the field of sixes. Outside of this new model the 40 is continued with the refinements necessary to bring it thoroughly up-to-date.

The new six which has been on the market but a short time is a left-drive center-control product fitted with Deaco electric lighting and starting and a 3.75 by 5.5-inch power plant. The L-head cylinders are cast together in a single block and have the manifolds cast separate from the cylinders. The valves are all located on the right side motor and are interchangeable. The camshaft is operated through spiral gears. The motor is lubricated by a combination pressure and splash system in which the oil is forced to the main bearings and to the timing gears. The water is circulated by a centrifugal pump through a honeycomb radiator.

The clutch is a leather cone, the gearset a three-speed and the rear axle floating. A feature of note is that the rear springs are of cantilever design.

The 40 motor is a 4.875 by 6 with its cylinders cast in pairs. The wheelbase is 120 inches for the Speedway roadster and for the touring car bodies 128 inches. The ignition differs from the six in that two-double firing is used, two sets of spark-plugs firing simultaneously. Pressure gasoline feed is used and either the Rayfield or Schebler carbureter is fitted at the purchaser's option. Left drive and center control is used, the gearshift providing three forward speeds. The bodies are sheet metal and are characterized by their low appearance, roominess and wide doors.—National Motor Vehicle Co., Indianapolis, Ind.

#### Norwalk Cars Have Electric Gearshift

The Norwalk company is putting two sixes on the market, each equipped with four types of body and one rated at 48 horsepower and the other at 54. Both have electric gearshift. The larger chassis, known as model C, has a motor bore of 4 inches and a stroke of 5.5 inches, with the cylinders cast in threes. T-head castings are used with the intake valves on the left side and the exhaust valves on the right side. The valves are operated by a camshaft driven by spiral gear. The motor is supported at three points and carries a gearset in a unit with it. This model distinguished from the other Norwalk model by the fact that both springs are overslung, while the frame is underslung. The weight of this chassis is 2,700 pounds.

Model D Norwalk chassis, the smaller of the two sixes, is also provided with a unit power plant suspended at three points. Left steering is used on this, as on the larger model. The cylinders of this model are cast in blocks of three and are of T-head shape with a bore of 3.75 inches and a stroke of 5 inches. The general design of the motor follows the larger model and the electric equipment, which consists of a Westinghouse starting system and an Atwater-Kent ignition system, is the same on both models. A set of dry cells is carried for emergency. The bodies furnished with these cars are a two-passenger roadster, four and six-passenger touring cars and a limousine with a seating capacity of six persons.—Norwalk Motor Car Co., Martinsburg, W. Va.

#### Oakland Makes Fours and Sixes

The Oakland manufacturing policy for this year is one which aims to meet the requirements of every class of automobile buyer

by including the factory's output both fours and six-cylinder machines. A new light six features the line, while two four-cylinder types which are practically continuations of the same models of last year are offered.

The distinctive V-shaped radiator which distinguished the cars last year is continued on all models for 1914, while the non-continuous running board construction used last year has been replaced by continuous cast aluminum running boards.

Prices for these Oaklands are quoted with full equipment, which is the first time the fixtures have not been listed extra. Besides the regular array of equipment, Delco combination electric cranking, lighting and ignition is included. Thus the cars are really cheaper than last year. Model 48, the light six, lists at \$1,785; while model 43, the larger of the two fours, is sold for the same amount. Its price last year was \$1,750 without equipment. Model 35, the smaller four, for which \$1,075 was asked in 1913 without equipment, sells for \$1,200 now ready for the road.

Although right drive and control were used on all Oaklands last year, models 48 and 35 have center control and left drive for 1914; model 43 only retaining the right drive and control.

The light six has a 3.5 by 5 motor, the cylinders being block cast and integral with the upper half of the crankcase. The valves are all on the left and enclosed. The gearbox bolts to the rear of the flywheel housing making a unit power plant which is suspended from the frame at three points. The crankshaft has four plain bearings, and this as well as the other reciprocating parts are made as light as possible without sacrificing strength. Vibration is reduced to a minimum in this way. A special feature of the motor is the double exhaust manifold, one arm of which takes the burned gases from each three cylinders. This prevents burned gases from one cylinder entering another due to exhaust valve openings overlapping.

Chassis details include a three speed gearset, cone clutch, unenclosed drive shaft paralleled by a torsion arm, semi-floating rear axle, underslung three-quarter elliptic rear springs, and gasoline tank at the rear feeding by pressure. The touring body of this new six is of the latest streamline type, having a round-topped hood and radiator to conform.

Model 35, the smaller four has a motor of the same cylinder dimensions and general design characteristics as that of the little six just mentioned. With a unit power plant, having block cast cylinders in unit with the crankcase, L-head type with valves on the left, and reciprocating parts of the same dimensions wherever practicable, this four-cylinder engine remains unchanged over last year. Back of the motor, the cone clutch conveys the power to the three speed gearset and this in turn sends it through a propeller shaft enclosed in a torque tube back to a semi-floating rear axle.

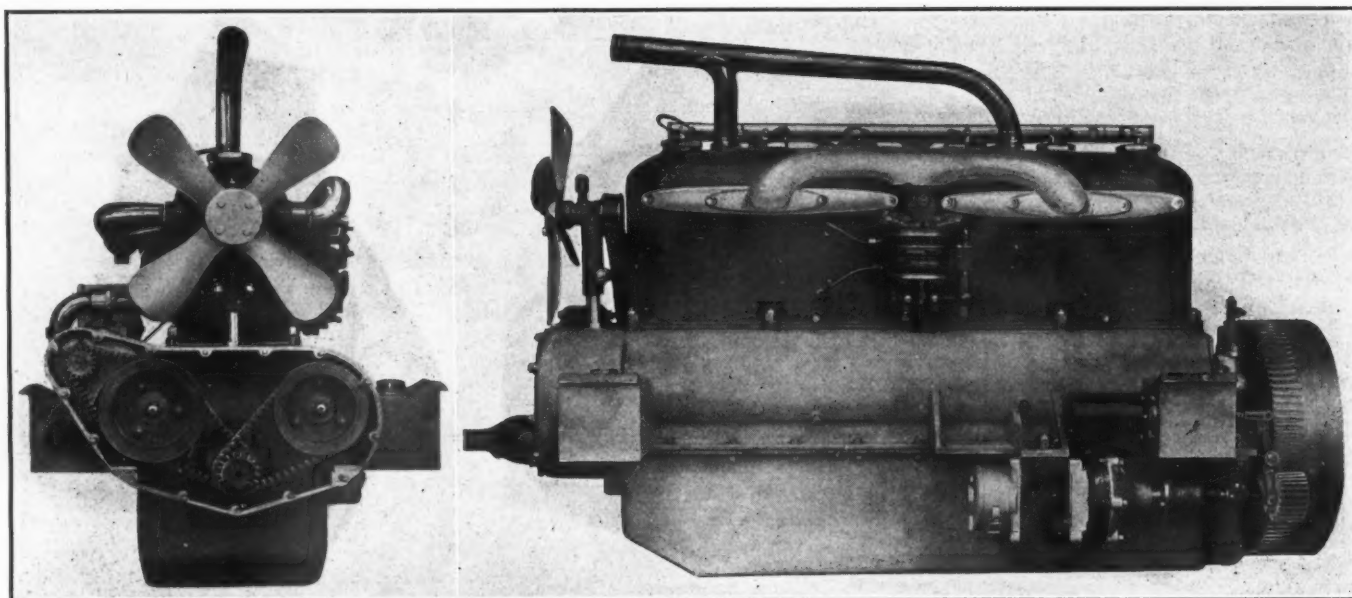
The motor of model 43, the larger four-cylinder car of the line, has been increased in bore and stroke. Formerly it was a 4.125 by 4.75 inch engine, while in the new series it has dimensions of 4.25 by 5.25 inches, giving a power increase over last year. In the general design, however, the previous features hold. The cylinders are L-head, cast in pairs and bolting to the aluminum crankcase which is split horizontally in the usual way. The gearbox bolts to the rear of the crankcase, giving a three-point supported unit power plant and in all other respects, the same engine design as that used on the two models mentioned above is adhered to.

A cone clutch, three-speed gearset, unenclosed driveshaft, floating rear axle, underslung rear springs and pressure feed gasoline system with rear gasoline tank are among the specifications of the model 43 chassis which have come in for no change.

Save for the change in running board construction, this car has the same outward appearance as last year.—Oakland Motor Car Co., Pontiac, Mich.

#### Ohio Changes Motor Design

Most of the Ohio changes are found in the motor and bodies. On the six the motor is of the T-head type, with the 4 by 6



Front and side views of new Fischer slide-valve motors used in Palmer-Singer cars

cylinders cast in block and the valves inclosed. Both valves and pushrods are lubricated from the crankcase, while the motor is lubricated by means of the constant level splash system, the connecting-rod ends dipping into reservoirs under each cylinder, which are kept supplied by a plunger pump carrying oil from the lower half of the crankcase. Two small reservoirs over each main bearing insure a constant stream of oil to these parts. There is an oil gauge on the crankcase. The three-point suspension principle is employed, the front end of the motor being suspended from an arched cross member.

The four-cylinder motor on the Ohio model has its cylinders cast in pairs instead of in block, the cylinders being 4.25 by 4.75 inches. The gearshift and emergency brake levers in both cars are located in the center. The six is left steer and the four right. Both models are electrically started and lighted. The side lights have been abandoned, auxiliary bulbs in the headlights supplanting them.

Bodies are of the streamline type and with clean running boards. The gasoline tank is carried in the cowl dash, spares are carried in the rear. The six has a 132-inch wheelbase.—Crescent Motor Co., Cincinnati, Ohio.

#### Oldsmobile Offers Choice of Lengths

For 1914 two wheelbase lengths in a single six-cylinder chassis are offered by the Olds Motor Works. The new car appears in seven-passenger form with a 139-inch wheelbase and in four- and five-passenger form with a 132-inch wheelbase. Last year but one chassis was offered with a 135-inch wheelbase.

Price reductions are to be noted as follows. The seven-passenger is listed at \$3,150 and the four- and five-passenger at \$2,975, last year's prices being \$3,350 for the seven and \$3,200 for the four and five.

The motor has been made larger, the bore and stroke now being 4.25 by 5.25 inches, while the 1913 model had a motor of 4.125 by 4.75 inches. The intake manifold, water pipe, fan and wire conduit are now to be seen white enameled and the exhaust pipe of shiny black rust-proof material. The drive from the motor is still by cone clutch to a three-speed gearset and then to a floating rear axle. The rear springs have been lengthened slightly and are now underslung. Tires are 36 by 5 inches all around, while the 1913 model had 36 by 4 1/2 in front and 37 by 5 in the rear. Changes have been made in the matter of equipment and body. The only addition is the Taylor oil tire pump, but a new type of Jiffy curtains has been adopted. These curtains fold into the front of the top when the latter is up. A new Circassian walnut cowl is used and all the instruments are now set flush.

The running boards have been made clean and are now of aluminum instead of fiber as in 1913. The same change has been made in the toeboard. Right steer and right control are retained, but the wheel is notched so as to make steering easy.—Olds Motor Works, Lansing, Mich.

#### Overland Now on One Chassis

Standardization at the Overland factory has dictated a policy for this year which means the production of one chassis model only. The 1914 chassis is known as model 79 and is a continuation of the 1913 model 69 with several changes. A slight reduction in price of model 79, as compared with that asked for 69, is also a point of interest. Greater production and parts standardization makes it possible to shave the figure to \$950. Model 71, the larger of the two 1913 chassis, has been dropped.

None of the Overland characteristics of mechanical design has been changed, those alterations which do appear being essentially detail refinements. The four-cylinder, L-head motor, with its singly-cast cylinders, the mounting of the three-speed gearset in unit with the rear axle, the carrying of the drive shaft within a torque tube, the three-quarter floating rear axle, and the right drive are features which remain as they were.

Although the cylinder bore has been increased from 4 to 4.125 inches, the stroke remains at 4.5 inches. The valves are on the left and a new type of valve plungers are used. These have a yoke which bolts at its center to the crankcase and clamps each set of two plungers for each cylinder. Although pressed steel now replaces aluminum for the lower half of the crankcase, no change in the shape of this is noticeable. Five plain bearings carry the crankshaft rigidly.

The Gray and Davis two-unit cranking and lighting system by electricity is fitted to this new Overland motor at an additional cost of \$125. The motor and generator are mounted on the left front side of the motor and are driven off the end of the crankshaft by silent chains. The Overland now has a new type of ignition which is independent of any other electric apparatus which may be fitted. It is of the Splitdorf dual type, the magneto placed on the engine's right side.

The flywheel and leather-faced cone clutch are uninclosed, and back of them is the yoke carrying the front end of the torsion tube. In accord with the practice where a torsion tube is used, a single universal joint is fitted to the front end of the drive shaft. The gearbox at the rear axle bolts through flanges to the axle housing and the tube.

On this new Overland the wheelbase has been lengthened from 110 to 114 inches, and this results in a longer, more rangy



body, both in appearance and actual room for the passengers. The increase is given to the body almost entirely, as the hood has been lengthened only .75 inch over that of model 69. The clear running board and smooth sided effects are very pronounced, while fenders are crowned and rivetless. Besides the touring design, the Overlands of 1914 are in roadster and coupé types as well.—Willys-Overland Co., Toledo, Ohio.

### Packard Has Two New Sixes

Packard cars are made in two chassis models, 238 and the 48. Both of these cars are sixes, the 48 being the larger. Packard design features are preserved in these cars, while they present the latest in equipment and construction throughout. The left drive and centralized control board feature on the steering column are now standard with Packard, and the location of the gearset in unit with the rear axle is unchanged.

Twenty body styles are offered on the new 238 chassis, which is now standardized, so to speak, so that all bodies are fitted on the wheelbase of 140 inches. This is increased somewhat over that of last season's touring car and phaeton wheelbase lengths, which were 134 and 138 inches, respectively. For the roadster, too, this was formerly shortened up to 115.5 inches.

It is in the motor that the greatest changes are to be found. While the dimensions of 4 inches bore and 5.5 inches stroke are retained, leaving the rating at 38, the L-head cylinders are now cast in blocks of three instead of in pairs. The motor develops about 60 horsepower at 1,800 revolutions per minute.

A new oiling system is incorporated by the use of hollow camshaft, drilled connecting-rods and crankshaft through which the oil is forced to the points of use. The electric system of the 238 is also new, in that a Bijur system with separate motor and generator.

Another feature new to Packard construction is the undersliding of the three-quarter elliptic rear springs. The fronts are mounted over the axle. The clutch is a dry-plate type.

Though the external body lines are still distinctively Packard, they have been brought up to the minute in design. The hood slopes slightly from the cowl down to the radiator and the cowl rounds into the body. The chassis alone may now be had for \$3,100. All open models except the special touring body are fitted with a one-man type of top in addition to the other very full equipment.

The new model 48, known as the 2-48, has just made its appearance. The design of the car now follows closely the 238 design. Like the 238 the cylinders are cast in blocks of three and are L-head instead of T-head, in pairs as in the former model. They measure 4.5 by 5.5, giving a rating of 48. The Bijur electric system with separate motor and separate generator is used as well as the concealed oil leads for the motor lubrication system the same as on the 238. A magneto furnishes current for the ignition system. A dry-plate clutch is housed in a rearward extension of the crankcase.

Following the Packard policy started with the 238, the 248 is furnished in two types of chassis with one length of wheelbase, 144 inches; this is 4 inches longer than the present 238 and 5 inches longer than the previous model 48.—Packard Motor Car Co., Detroit, Mich.

### Paige Continues Two Chassis

Continuing the policy of concentration, the maker of Paige cars will build the same two chassis models this year as last. These models are the 36, the leader of the line, and the 25. Both have four-cylinder motors of the block type, which power plants, as well as all other parts of the chassis, show little or no change.

Four body types are fitted to the model 36 chassis, two open and two closed, while the model 25 appears in roadster and touring designs only. The two Paige cars differ materially, both mechanically and in general outward appearance.

The model 36 motor is of the L-head type, with the gear-box bolted to integral crankcase arms which pass around the

enclosed flywheel. The size is 4 by 5, the valves are on the left, and all of the electrical equipment, together with the centrifugal water pump, is carried on the right side. The intake manifold is very short, due to the fact that the gasoline tank in this car is placed under the cowl, allowing the carburetor to be placed higher.

The crankshaft is mounted on three bearings. A feature of this power plant is the silent chain drive for the camshaft, magneto shaft and generator. The lubrication system combines force-feed and splash in connection with the eccentric-operated plunger pump from the camshaft. The lighting and cranking apparatus is of the two-unit Gray & Davis type. The Bosch magneto is carried on both models. The clutch of the 36, as on the model 25, is of the multiple-disk, cork-insert type, running in oil. The gearset allows three forward speeds. The rear axle is three-quarter floating. Rear springs are full-elliptic, with scroll and shackle and underslung from the axle tubes. Left drive and center control are used.

The model 36 has a wheelbase of 116 inches and carries every necessary item of equipment. Tires are 34 by 4 on demountable rims, with non-skid treads on rear.

Like the model 36, the 25 Paige has a unit power plant, although the general design of this engine is different from the larger. With a bore of 3.75 and a stroke of 4, the motor develops 25 horsepower normally. The cylinders are L-head, inlet and exhaust manifolds are cast integrally with the cylinder block, there being only one external connection to carburetor and exhaust pipe, respectively. A constant-level splash lubrication system is used, which provides amply for this feature.—Paige-Detroit Motor Car Co., Detroit, Mich.

### Palmer and Singer Adopt Magic Motor

Springing the surprise of the season the Palmer & Singer Manufacturing Company have just announced that their leaders for the 1914 season will be equipped with the Fisher crescent slide valve motors known as the Magic. Two chassis types fitted with six-cylinder motors of this design will be marked and in addition the six of last year will be continued along with the model L, a new six just brought out. The latter two designs are poppet types.

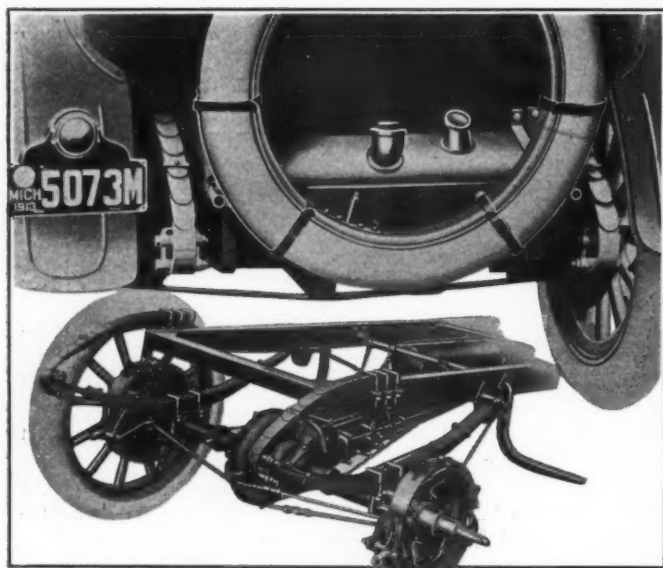
The Fischer motor was described in THE AUTOMOBILE for Dec. 19, 1912. It has as a substitute for the regulation poppet valves two slide valves arranged in opposite sides of the cylinder walls. These valves are crescent-shaped and each occupies 69 degrees of the cylinder wall circumference, being imbedded therein. They are of cast iron and extend two inches below the end of the cylinder. At the lower extremities a rocker arm mechanism gives a vertical reciprocating movement to the sleeves. The valve ports are located in the upper extremities of the sleeves and furnish direct openings to the intake and exhaust manifolds.

The general design of both the new chassis follows along similar lines. The motors are rated at respectively 40 and 60 horsepower and have their cylinders cast in threes, one being a 3.375 by 4.75 and the other a 4 by 5.625. The crankshafts are carried on seven bearings and lightweight reciprocating parts are used.

The new motors are lubricated by a combined pressure and splash system. Ignition is Bosch dual. Four speed gear boxes are provided, with inclosed shaft and 41-disk clutches running in oil, taking the power to the rear axle. The general chassis details follow those of the two poppet sixes described below. The bodies fitted are modern streamline effects of exceptional beauty.

Besides the new magic chassis there are two poppet sixes which the Long Island factory will continue to turn out.

The sixes rated at 50 and 45 horsepower and mounted on 134 and 128-inch wheelbases compose the remainder of the line. Both of these cars are made up in touring and roadster with center control bodies as stock and other bodies will be made on order. The 50 is left drive and the 45 right with right control. Both motors are T-head designs and both of their



Oakland spare tire carrier, Overland rear system

cylinders cast in blocks of three. The motors, however, are of different design as well as dimensions. The 50 is suspended at three-points and the 45 at four. The 50, which is the latest product of the Long Island concern, is a 4 by 5.5. The intake valves are located on the left side and the exhaust on the right; the intake manifold is cast directly with the cylinders, a practice new for the Palmer and Singer Company. The exhaust manifold is a separate casting and is on the same side of the motor as the water pump. The magneto is mounted on the left side of the motor. A 2-inch C. R. G. carburetor is used, fitted with hot-water pipe and taking the gasoline feed by pressure from the gasoline tank located at the rear of the chassis. This tank has a capacity of 22.5 gallons. Ignition is by an Eisemann dual system and the electric lighting and cranking system installed is the Westinghouse 6-volt single wire working in conjunction with a Willard storage battery. A disk-in-oil clutch is used with Raybestos friction facing, delivering power to a three-speed selective gearbox geared 3.75 to 1 on high and mounted as a unit with the rear axle. Both brakes are mounted on the rear wheels and are of generous dimensions, the drum diameters being 17 inches and their widths 2.5 inches. The weight of this chassis is 2,650 pounds.

The Palmer-Singer 45 has a 4 by 5 motor. The intake valves are located on the right side and the exhaust valves on the left side, the two camshafts being driven by helical gears, and the magneto and water pump being driven on the same longitudinal shaft. The same ignition, carburetion and cooling systems are used in this car as in the 50 except that the radiator is of standard design, whereas in the 50 a V radiator is used. A Westinghouse single wire 6-volt starting and lighting system is used on this car as on the larger one. The clutch is a disk-in-oil, the difference from the clutch used on the newer model, in that it has steel against steel plates instead of Raybestos facing. A three-speed gearbox is also provided on this model and as in the larger one it is mounted on the rear axle. The gearshift control as well as the steering wheel is on the right side, but in the case of the 50 the steering is left and control center. A full line of equipment is supplied with both models.—Palmer & Singer Mfg. Co., Long Island City, N. Y.

#### Partin-Palmer Has Novel Motor

The most striking feature of the new Partin-Palmer 38 is the power plant which is a block type with the valves in the head. The cylinder casting is integral with the upper half of the crankcase, eliminating the joint at the base. A departure from the standard overhead type is the head casting which is secured to the cylinder by bolts and which completely incloses the valve

action, thereby eliminating noisy action. The joint between the casting and the cylinder head is sealed with a copper asbestos ring held with a pressure of more than 3,000 pounds per square inch. The casting can be removed by taking out the bolts which hold it.

The spark plugs are set at an angle in the head casting and the valves are carried without cages. Both the valves and the stems are entirely surrounded by water. This water cooling which has been liberally designed is extended around the exhaust manifold and the makers claim that this as the effect of creating a partial vacuum in the manifold through the reduction of the temperature of the gases in the exhaust pipe, and that this results in an increase of 12 per cent. brake horsepower. Accessibility has been studied throughout the motor, the pistons and connecting-rods being easily removable without interfering with the radiator connections. Another feature in line with this is the split crankcase which permits the bearings to be reached without disassembling the motor.

Electric starting and lighting is furnished as an added figure and full running equipment is furnished with the car. Left drive and center control is used.—Partin Mfg. Co., Chicago, Ill.

#### Paterson Has Dropped Fours

The W. A. Paterson Co., Flint, Mich., has dropped entirely its two four-cylinder representatives of 1913, models 43 and 47. Instead, an entirely new four-cylinder model is built. The general specifications covering this new left-drive chassis include a unit power plant with cylinder bore of 3.5 and stroke of 5 inches. The principle of the chassis as a whole is the two-unit construction whereby the power plant comprises one unit and the rear axle takes in the final drive and differential gears.

The valves are inclosed within cover plates, cooling is mechanically taken care of by a centrifugal water pump, and lubrication is by the constant level splash system with the oil drawn from the reservoir at the bottom by a positively-driven plunger pump. Combined Delco electric cranking, lighting and ignition is standard equipment at the price.

The clutch, a leather-faced cone with spring inserts, is inclosed as a part of the forward unit, as is the three-speed gearset which has gears and shafts of chrome-nickel steel mounted on ball bearings. The control levers are at the center and over the gearbox.

The Paterson chassis has a wheelbase of 112 inches. The propeller shaft carrying the power to the rear is enclosed within a torsion tube and has a universal joint at its front end. The rear axle is floating and mounted on Hyatt roller bearings throughout. The wheels are fitted with demountable rims and have 32 by 3.5-inch tires all around.

Paterson bodies of 1914 are of new design, with flush sides, concealed hinges and inside door handles. Comfort has been carefully considered, ample room being provided in both compartments of the touring car and in the roadster. The equipment leaves out nothing which the modern motorist requires.—W. A. Paterson Co., Flint, Mich.

#### Pathfinder Announces Two Sixes

Two six-cylinder chassis and a four make up the Pathfinder line for 1914. The Pathfinder-Continental motor is used in both models; the cylinders of the large six are 4.125 by 5.25, and of the smaller six 3.75 by 5.25 inches. The wheelbase of the large six is 135 inches and of the small six 124 inches.

The single four-cylinder chassis model, which was the sole design for 1913, is continued practically without change from the original design. The motor is 4.125 by 5.25 inches, and the only change is the lightening of the pistons of the Pathfinder-Continental. In other mechanical features the four is a replica of the past season's product. The general arrangement of the chassis is a unit power plant with the cone clutch in the engine flywheel, together with a selective three-speed gearset. The floating rear axle is employed. The drive is through a Pathfinder



yoke and torsion tube assembly mounted on a heavy cross-member in the center of the frame.

One of the distinctions of Pathfinder design is the wheel which by the shape of the spokes and felloe is given a colonial effect. The maker calls it the chariot wheel. The design is a Pathfinder patent and is used on the six models also.

There are many points of similarity between the Pathfinder four and the new sixes in chassis design. The yoke and torsion tube is common to both and the theory of construction is practically the same.

The four-speed transmission is employed in the six, with direct drive on third, and a gear ratio of 2.7 to 1 on fourth for high-speed work. Left-hand drive is standard with the sixes and the conventional Pathfinder instrument board containing a novel combination utility and dash lamp speedometer, 8-day clock, switches and oil gauges is more complete on the six-cylinder models. A cowl gasoline tank is used with a filler neck on the instrument board on the right side.

A pronounced feature of the Pathfinder six models is the V-shaped radiator. The body design gives the same streamline effect. The chief changes in body design in the fours and innovations in the sixes are tendencies toward these streamline effects and more sweeping curves in the front fenders which are also made smooth on top.

The bodies are all noteworthy for the artistic adaptation of the streamline form which has become a feature of the cars for this season. The roadsters are particularly low and racy in appearance.

Electric cranking and lighting is provided on all models and the electric horn has been added as standard equipment. Over-size tires are included on all models with Q. D. demountable rims and carriers on rear of fours and sixes.

The four-cylinder line consists of a Martha Washington Colonial coupé, a five-passenger touring car, a two-passenger armored roadster and a two-passenger special cruiser.—Motor Car Mfg. Co., Indianapolis, Ind.

### Peerless Continues Three Sixes

The three Peerless Sixes which made up the line last year are continued with changes which follow the general lines of development for this season. The three cars are known as the 38-Six, 48-Six and 60-Six. They are all alike in principle and construction, merely varying in the weights and sizes of the parts. The most important changes have been made in improving the riding qualities of the car and the alterations have lowered the center of gravity considerably. Gasoline tank has been placed under the rear of the body and is now slung between the two side frame members. The tires are carried on a rack in the rear instead of on the running board. The springs have been made easier riding by using the same number of leaves but decreasing them in thickness and the front and rear axles are now fitted with shock absorbers. Another development in the way of easy riding is the 10-inch upholstery which is an inch deeper than last year. The equipment of the car has been made more complete and now includes a speedometer clock, combination bulb and electric horn and a power tire pump.

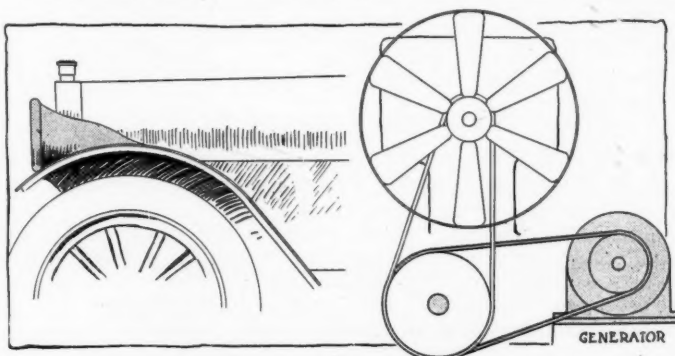
The sizes of the three power plants are 4 by 5.5; 4.5 by 6 and 5 by 7 for the 38, 48 and 60 respectively. Differences in the engine are small as compared to last year, but a change may be noted in the pistons where three rings are now used instead of four. All three of these rings are located in the top of the piston and it is of lighter construction with a deep web for rigidity. The T-head cylinders cast in pairs are so designed that there is space between them to provide for seven main bearings. The valves are nickel steel and are operated from an eight bearing camshaft. The camshaft, magneto and water pump are all driven through spiral gears of semi-steel running in oil. Gasoline is by pressure from a tank which is a new design for this year being featured by very strong stiffening members. The tank has a capacity of 22 gallons and a dirt trap is supplied in the gasoline line. Gray & Davis electric starting and lighting

is provided as formerly and ignition is by a Bosch dual system.

Peerless type of expanding band clutch operating through a worm and screw is maintained. Friction surface is chrome leather with cork inserts which form about a third of the frictional surface. A four-speed gearset and a floating axle make up the rest of the transmission. The muffler this year is placed lengthwise instead of transversely in the chassis. A full line of bodies is supplied with all models.—Peerless Motor Car Co., Cleveland, O.

### Pierce-Arrow Has Three Sixes

Pierce-Arrow cars for 1914 appear in three chassis forms, each with two wheelbase lengths and known as the 38 C-2, 48 B-2 and 66 A-2. All Pierce-Arrows have six cylinders and changes have been made in many parts of the cars. All models now are equipped with forged steel flywheels instead of cast iron, this being necessitated because the teeth for the engagement of the electric cranking gear formerly were not tough enough to withstand the wear. The cast iron headed valves used in the 1913 models have been discarded and high-speed tool steel used instead, and although this material is more difficult to forge, tests have shown that the results obtained are worth the extra expenditure in money and labor. It is claimed that these valves will not warp or pit and are much lighter, thus decreasing any tendencies to become noisy. On the models A-2 and B-2 the number of water outlets have been doubled, thus increasing the water circulation and avoiding any tendency on the part of the motor to heat excessively. To do away with clutch grabbing the Pierce-Arrow engineers have eliminated the cork inserts of the cone clutch and in their stead are using flat steel springs under the leather facing. Another improvement to effect smooth engagement is the adoption of an inclosed dust cover over the clutch universal. This permits of more thorough lubrication of the square blocks and, it is stated, has helped considerably to make the clutch take hold smoothly. The oil pipes which previously had soldered unions are now flanged, thus insuring rigidity. The fan belt bracket has been redesigned so as to make the operation of belt adjustment easier. On the C-2 and B-2 the compression release has been discontinued owing to the installation of the Westinghouse cranking system. However, on the A-2 it was considered necessary to retain the compression release in the remote event of having to crank the engine by hand, under which condition it is almost impossible without a release. The adoption of an electric starter on all three models to supplant the air starter of last season was deemed necessary. The foot throttle has been given a greater degree of travel, the air pump has been changed, and the secondary wire conduit replaced with a more efficient one. In order to enable rapid dismounting of the clutch the pedal shaft and bracket have been redesigned, and it is claimed now that the clutch may be removed in 20 minutes. Wider gears are used in the gearset to gain additional strength and longer life, a longer sliding boss is used for the third speed gear, thus making it easier to slide into engagement, and the oil retainers at the front end of the gearset case made of new design so as to eliminate oil leakage. An oil reservoir has been provided inside the short propeller shaft rear universal joint



Pierce lamp moulded with fender. New generator on Peerless

and wicks inserted so that the lubricant will last a longer time and reach the desired points more easily. An interlocking device is now used to prevent the third speed gear slipping out of mesh, and although the installation requires additional complications the results have been found to have been worthy of the efforts. In order to compensate for the added weight due to the numerous accessories placed on Pierce-Arrow cars, the axle shafts have been made heavier to meet the added load, and a new design has been adopted for the oil retainers on each side of the bevel gears in the rear axle to prevent lubricant leaking upon the brake bands. The larger diameter shafts have necessitated increasing the size of other parts proportionally.

The gasoline gauge is now located in a pocket between the two front seats where it can be seen easily and the gasoline shut-off valve has been made more accessible by providing a door in the right-hand apron and extending the handle of the valve through the underframe. The tread on the models C-2 and A-2 has been increased 1 inch to 57 in order to give a shorter turning radius, and in the case of the A-2 to get more tire clearance in the rear between the sides of the body and the tire. A new type of hood catch is now used which is more accessible than the former type and also prevents breakage due to frame weaving. A new type of storm curtain is used on Pierce-Arrow cars, these curtains being built under Jiffy patents in the Pierce factory. Aside from the changes noted the three Pierce-Arrow chassis will appear as last year. The 38 C-2 comes in two wheelbase lengths, 127 and 132; the 48 B-2 in 134 and 142-inch lengths, and the 66 A-2, 140 and 147. In general design all three cars are the same. The motors being of T-head construction, the cylinders cast in pairs. Driving is through a cone clutch through a four speed gearset to a semi-floating rear axle. The motor dimensions on the 38 C-2 are 4 by 5½ inches, on the 48 B-2, 4½ by 5½, and on the 66 A-2, 5 by 7 inches.—Pierce-Arrow Motor Car Co., Buffalo, N. Y.

#### Pilot Adds a New Six

Two essentially unaltered chassis and a new chassis comprise the Pilot line for 1914, two models being known as the 50 and one 60, the 50 being a four-cylinder and the 60 special a six. The feature of this line is the equipment which includes besides the conventional appurtenances such as cigar lighter and trouble lamp, electric motor driven horn, power tire pump, automatic headlights which turn in the direction in which the car is to be steered, hind view reflector and Neverout license bracket.

This year the company is offering optional location of the steering post, whereas last year right drive was stock.

The special is a new creation with a 120-inch wheelbase selling at \$2,250 in two passenger roadster and five-passenger touring form. The only difference between the special and the regular 50 is in the gear ratio and as before mentioned in the wheelbase. The gear ratio on the regular cars is 3.5 or 4 to 1 as desired, but the special has a 2.5 to 1 ratio. The four cylinder motor has received only detail changes for the coming year, but as far as general appearance and arrangement is concerned it is the same. The motor dimensions are 4.5 by 6, the cylinders are T-head construction cast in block.

The greatest advances have been made, in refining the body and the body details, the cowl shows more graceful lines, the hood blends better with the rest of the car and the clean running boards and curved fenders all go toward making an up-to-the-minute motor car.

The Pilot 60 is almost the same as the 50 except as regards wheelbase, the larger car having 132 inches. The drive is by cone clutch through a selective gearset to a floating rear axle the stock gear ratio being 3.5 to 1. Both cars appear in roadster, and touring form, the former with a two passenger body and the latter with a four, five and seven passenger body.—Pilot Motor Car Co., Richmond, Ind.

#### Pope Model 35 a New Car

For 1914 the Pope company is marketing what is known as model 35. On this chassis there are three types of body, a

five-passenger touring car, a two-passenger roadster and three-passenger coupé. The four-cylinder motor is cast in pairs and have the chrome nickel steel valves located in the head. The crankshaft is carried on three bearings which have a total length of 10.875 inches. The motor is oiled by a mechanical oiler which takes the lubricant from the crankcase reservoir and forces it to each main bearing and cylinder wall; outside of this there is also a splash feed. The electric system of the car includes a Gray & Davis electric lighting and cranking outfit and Bosch high-tension dual ignition with a storage battery that is entirely independent of the starting and lighting systems. The current for lighting and starting is derived from a generator mounted on the left side of the engine and driven by silent chain from the pumpshaft. At a car speed of 12 miles per hour, the generator furnishes sufficient current to carry the entire lamp load and maintain the battery fully charged. The battery is located under the tonneau floor. The cranking motor is under the left rear support of the engine and is geared to the flywheel at a reduction of 21.5 to 1. The clutch is a cone faced with autobestine. It is provided with a clutch brake, the couplings and methods of adjustment of the clutch are the same that have been heretofore used in Pope practice. Drive is by shaft to a bevel gear and floating rear axle. Left steering and center control are used and the standard operating mechanism is fitted. Rudge-Whitworth wire wheels with one spare are fitted at an extra charge. The wheelbase is 118.5 inches.—Pope Mfg. Co., Hartford, Conn.

#### Pratt Has a Four and a Six

This year the Pratt line will afford the purchaser either a four- or six-cylinder model upon which a full line of bodies are supplied. The two chassis are not similar throughout, the six having left drive and center control and the four having right drive and right control. The six-cylinder chassis has 4.125 by 5.25 power plant with cylinders cast in threes. The cylinders are L-head the valves being located on the right, thereby providing a clear space on the left side for the mounting of the left drive steering gear. The magneto is driven by a longitudinal shaft on the right side and the pump is on the left. The manifolds, both intake and exhaust, are on the right side. A Zenith carburetor to which the gasoline is fed from a 24-gallon tank in the rear is supplied.

The four-cylinder model has the 4.5 by 5.75 cylinders cast in pairs. They are L-head and unlike the six have their valves on the left side which may be expected owing to the fact that right steering is used. The motor is cooled through a cellular radiator and a gear pump. Ignition is supplied by Bosch dual system and the gasoline system includes a Holly carburetor.

In the starting and lighting system both cars are alike, the Gray & Davis being used and operating through double wires at a voltage of 6. The clutch is a dry disk having raybestos friction faces, the gearset has three speeds and the rear axle is floating, delivering the drive through the rear springs. The wheelbase of the four is 122 inches and of the six 134 inches. The equipment is the same in both models and includes demountable rims all around.—Elkhart Car Mfg. Co., Elkhart, Ind.

#### Premier Adopts New Motor Type Auto

One of the sensations of the season in motoring circles is the new six announced by the Premier company, the motor of which is very decided departure from engine design in America. It is called the Weidley motor, after its designer, George W. Weidley, chief engineer of the Hoosier concern.

The Weidley motor is a poppet valve type but these valves are all in the head without cages and are operated by a single camshaft which lies above the cylinders. This overhead camshaft is driven from the crankshaft by a vertical shaft through worm gears or rather, 45 degree helical gears, and the whole mechanism, shafting, gears, camshaft and valves is completely inclosed and copiously lubricated. Twenty-three miles per gallon of gasoline on city streets in a touring car with four people up is the record claimed. The cylinders are 3.625 by 5.5.



The six cylinders are cast in one block together with the entire crankcase. The cylinder head is another unit and carries all the valves and the camshaft, while covering it is a smooth aluminum plate that makes an oil-tight housing for the valve mechanism. Even the water pipes have been eliminated, the radiator being bolted to the motor itself without any rubber connections.

The valves are large, considering their location in the head; they have an outside diameter of 1 15-16 inch and a clear opening of 1 21-32 inch. There are no rocker arms used, the camshaft being right above the ends of the valve stems; but between the cams and the stem ends is one end of a very light steel finger pivoted at the other end. This carries the adjustment by which wear can be taken up and replaces the usual valve-stem adjustment. Silence of the valve mechanism is one of the first subjects of comment.

The Remy starting and lighting generator, the magneto and the water pump are driven by a gear like that on the crankshaft but located outside the vertical shaft gear so that these instruments are parallel to and on a level with the crankshaft. Mounted on the pump is a pulley for the fan belt.

Premier precedent is shattered in another respect. This is the unification of the power plant in the new design. In this the factory has gone beyond the practice of the strongest supporters of the unit power plant in making it complete by the incorporation of the radiator as a part of the unit. The essentials of the rest of the chassis do not differ greatly from previous Premier construction. The multiple-disk clutch is continued. The new gearset is a three-speed one with the control levers in the center and the driver on the left as formerly. The rest of the chassis is unchanged except the springs and frame. Rear springs on the new car are one-half elliptic instead of three-quarters.

The fuel tank is at the rear instead of under the seat. This tank is nearly half above the frame and the rear of the body cut away to fit it. Mudguards follow the contour of the wheels and are narrower than formerly, and to eliminate squeaks are not fastened to the running boards. The battery is hidden under the left apron where it is accessible.

The hood is remarkably short for a six, is exceedingly so in fact, for no one would recognize the car for a six from the appearance of the bonnet. The whole body has smooth lines and the sides are particularly high. The wheelbase is 132 inches, tires are 36 by 4 1-2. Four- and five-passenger and seven- and two-passenger bodies are marketed at a price under \$2,500.

The older Premier, known as the model 6-48, is continued. This has a six-cylinder motor cast in three of the T-head type, the cylinder dimensions being 4 by 5 1-2 inches. Aside from the motor it differs from the new six so far as the chassis is concerned only in the semi-floating axle and three-quarter elliptic springs. The 6-48 bodies include a roadster and five-passenger at \$2,785 and a seven-passenger at \$2,900.—Premier Motor Car Co., Indianapolis, Ind.

### Pullman Puts Out a New Six

Two fours and two sixes make up the Pullman output for this season. Three of these models are continued from last year with improvements and one of the sixes is a new design throughout, embodying features which are new to Pullman practice of previous years, such as an electric gearshift. The improvements which have been incorporated in the standard models include a new piston which is fitted with an oil groove pierced by small holes to prevent an excess of oil being sucked into the cylinder. Another improvement is a micrometric oil level adjustment on the motor which displaces the oil level arrangement that used to be on the dash. Other improvements for the season are a pressed steel torque connection, Westinghouse starter, dog clutch for direct drive in gearset, removable gas tank, safety link on spring shackles to prevent rear springs from turning over, reserve feature in gasoline tank, lower cowl and beautified body.

The new six which has been brought out this season is an

advanced design throughout, incorporating the latest ideas in every particular from the light six engine to the electric gearshift and streamline type of body.

The motor used in the new light six weighs but 600 pounds, including the flywheel and the regular equipment. It is a unit power plant and has its L-head cylinders cast in threes. The bore is 3.75 inches and the stroke 5.25 inches, giving an S. A. E. rating of 34 horsepower. The makers state, however, that the motor develops in excess of this. The valves are 1.875 inches in diameter and are carried on the right side of the motor. They are made with nickel steel heads and carbon steel stems.

The clutch has 21 disks faced alternately with Raybestos and steel held in contact by two independent springs.

The electric equipment for this car divides itself into four independent systems for lighting, cranking, ignition and gear-shifting. Lighting and cranking units are supplied by the Westinghouse system and the electric gearshift is the Vulcan.

The generator, which is a slow-speed type, turning at 1.5 crankshaft speed, starts charging the battery at car speeds of 10 miles an hour. For city driving a dimming attachment is fitted to the lamps.

Left drive is used, the steering wheel column carries the buttons for shifting gears and also the control of the carbureter air supply. The emergency brake lever, which is the only lever on the car, is mounted in the center of the car.—Pullman Motor Car Co., York, Pa.

### Rayfield Out with New Six

Introducing model D a new six, the Rayfield company confines itself to single chassis upon which any type of body may be secured. The 4 by 5.5 cylinders are cast in a block forming a single part of the unit power which extends back as far as the gearset. The cylinders are L-head and have their valves on the left side. The valve motion is secured from a chain-driven camshaft and the magneto, water pump, etc., are also driven by silent chain and are located on the left side of the motor. The intake manifold is a unit part of the cylinders casting and the exhaust manifold is separate. The motor is lubricated by force feed, the oil being delivered by a gear pump through the hollow crankshaft under pressure. Thermo-siphon cooling is used in conjunction with a honeycomb radiator. The carbureter is a Rayfield and is fed by pressure from an 18-gallon tank located at the rear end of the chassis and having a reserve reservoir of 1 gallon. The electric equipment includes a Mea high-tension magneto for ignition and a full electric lighting and starting system. No battery ignition is used, the electric cranking being depended upon to crank the engine fast enough to start directly on the magneto. The clutch is a disk with raybestos against steel plates. It is located in the flywheel and delivers the power to a four-speed selective sliding gearset. The rear axle is floating and the propulsion is taken through radius rods. 36 by 4.5 tires are used and the wheels are either wood or wire, this being optional with the purchaser. The wheelbase is 130 inches and the car is sold fully equipped.—Rayfield Motor Co., Christmann, Ill.

### Read a New Four Cylinder

The Read 30 is a newcomer in Detroit and is designed to sell for \$850 with full equipment. It is marketed in the touring car design only.

The motor of the Read car is a four-cylinder, block-cast type with valves on the right. The bore is 3.5 inches and the stroke 4 inches, developing 32.6 horsepower at 1,500 revolutions a minute. The ignition is by Bosch magneto of fixed type; a Stromberg carbureter takes care of the fuel, cooling is by thermo-siphon arrangement, and lubrication by splash.

With the motor is incorporated the clutch of multiple disk type and the three-speed gearset, making the conventional unit power plant outfit. The drive shaft is inclosed with a torque tube and has a universal joint at the front. The rear axle is semi-floating, geared 4 to 1 and having the usual form of external con-

tracting and internal expanding brakes. The rear springs are elliptic and underslung from the axle tubes. Wheels are of wood artillery type and fitted with 32 by 3.5-inch tires. The wheelbase of the car is 115 inches. Left steer and center control are incorporated, the steering wheel having a diameter of 16 inches.

The standard body color is grey striped with black, running gear being black also.—Read Motor Car Co., Detroit, Mich.

### Regal Shifts to Left Drive

The new series of Regal cars consists of four body models, three of which are built upon the underslung chassis, which has always been identified with cars of this make, and a five-passenger touring model built upon a conventional type of overhung chassis. This latter chassis was new to the Regal line for 1913, and is continued. The underslung chassis for all three models is of 108 inches wheelbase. The overhung model retains its wheelbase of 116 inches.

There are several changes, both mechanically and in the design of the bodies. The principal ones are the shifting from right drive and control to left drive and center control on both new chassis; the addition of electric lighting and cranking, the underslinging of the springs all around on the overhung model, a refinement of the clutch-operating yoke on the underslung chassis, the elimination of side lamps and the alterations in the body designs to bring them up to the latest dictates of fashion.

The underslung model has a four-cylinder, L-head, block-cast type of motor. The valves are on the left. The cylinder dimensions are 3.75 by 4.5 inches. Four integrally cast arms support the motor on a subframe, composed of tubular bars running lengthwise and parallel to the main frame, which bars are carried at either end on frame across members. The crankcase is of the barrel type, crankshaft has two bearings, camshaft has three; thermosyphon cooling is used; the electric system is of the Rushmore make, with two units.

The overhung chassis has a motor of somewhat higher power than that mentioned above, although in general appearance it is much the same. Its cylinders are 4 by 5, of the L-head type, and cast in a block. The crankcase is split in halves, the upper carrying the three-bearing crankshaft.

The Regals have cone clutches and the rear systems of both are identical in design and consist of the gearset, inclosed propeller shaft and rear axle all in unit. The gearset gives three speeds and is compactly designed.

The bodies of these cars have been brought up to the minute. The flush sided effect has been carried out and the cowls sloped into the bodies proper. This season the Regal Company is listing its cars with full equipment, it being extra before.—Regal Motor Car Co., Detroit, Mich.

### Reo Adds Electric Starter

A reduction of \$220 in the list price of the Reo constitutes the chief change for this season. One of the talking points of the Reo has been its complete equipment and this is amplified in the latest cars, so that the equipment now includes electric lighting, cranking and signaling systems, and extra demountable rims. An innovation is a dimming attachment for the headlights.

The bodies are of new design, hung low and with gondola back.

A new style tire carrier on the back holds the tail light and number tag, so as to comply with all laws.

There are no changes of note in the original design produced in 1912, at which time it was distinguished by being among the first to adopt left drive and center control. Its general specifications as continued for this year include a four-cylinder motor with cylinders 4 by 4.5 in size with the inlet valve in the head of the cylinder and the exhaust valve in a pocket on the side. A centrifugal pump, assisted by a one-piece fan, takes care of the cooling.

Double heating of the intake air is supplied by a hood on the

exhaust pipe from the hot water jacket on the carburetor. From the motor power is transmitted through a multiple-disk clutch to the three-speed gearset operated by the Reo one-rod control. The new series has the lever moved back slightly to further clear the forward compartment. Both brakes are operated by foot pedals through cables. Tires are 34 by 4 inches and the wheelbase is 112 inches.—Reo Motor Car Co., Lansing, Mich.

### Republic Specializing on Six

Under the model name of series E the six-cylinder Republic car is marketed for this season. It is thoroughly up to date with the left drive and center control features together with modified streamline forms of body. The six-cylinders are T-head and are cast in pairs. The dimensions are 4.25 by 5. The intake valves are located on the left and the exhaust valves on the right, the camshaft being driven by helical gears and chain. The motor is lubricated by force feed, the gear pump forcing the oil through a drilled crankshaft. The motor is cooled by a centrifugal pump in conjunction with a cellular radiator. The Carter carburetor is used, to which the gasoline is fed by pressure from a tank of 24 gallons capacity located at the rear of the chassis. The ignition system is combined with starting and lighting and is the Delco dual. The wiring is by double wire and the system operates at approximately 7 volts. The clutch is a leather cone, housed in the flywheel and the gearset a four-speed selective located amidships. Final drive is by shaft to a bevel gear floating rear axle which delivers propulsive thrusts through radius rods. The wheelbase is 133 inches.—Republic Motor Car Co., Hamilton, O.

### S. & M. Has Foreign Appearance

Entering the field this year with a six-cylinder car, made with three body types of European cast, the S. & M. car affords an attractive example of the streamline design. The power plant used in this car is the Continental light six, a unit construction combining the motor, clutch, gearset and electric starter. It is suspended at three points. The single point being located at the forward end of the motor and the other two points at the rear and formed by lugs which are a part of the crankcase casting. The cylinders are cast in two blocks of three and are 3.75 by 5.25 inches. The valves are mounted on the right and are interchangeable. The crankshaft has three bearings and is of 90,000 pounds per square inch material. Oiling is by combination force feed and splash, the oil being maintained constantly at a definite level. Electric system is divided into two distinct units, for ignition, starting and lighting. Ignition is furnished by the Bosch dual outfit and lighting and starting is by the Jesco system, working through a combined motor and generator. It is capable of spinning the motor from 70 to 80 revolutions per minute.

The motor generator is connected to the crankshaft by a silent chain and through an automatic clutch which releases in case of back kick.

The clutch is a Brown-Lipe multiple-disk and the gearbox a four-speed selective of Warner design. The rear axle is a floating Timken with a one-piece housing. The steering gear is a Gemmer. Two sets of brakes are used mounted on the same drum, the foot brake being contracting and emergency expanding.

The S. & M. line offers a choice of a five-passenger touring, two-passenger runabout and seven-passenger limousine bodies, all designed to secure a modified streamline effect. Features of the body are the large doors, mahogany cowl boxes and easy curves.—S. & M. Motor Co., Detroit, Mich.

### S. G. V. Has Electric Gearshift

The most interesting feature of the S. G. V. cars for 1914 is being made for 1914 and upon this all styles of body, from a runabout to a limousine, are mounted. The body lines do not show any great changes, the touring car having an extended cowl the addition of the Vulcan electric gearshift. The power plant has been slightly increased in size, but this has not necessitated



and the five-seated inside-driven coupé or landaulet being the only style of body which this concern has not put out before this year. The motor dimension has been changed from 3.75 by 4.375 to 3.75 by 6. The power plant is rated at 36 horsepower, but the makers state that it develops 51 on test, owing to its long stroke. The cylinders are L-head, cast together, carrying the valves all on the right side. The valves are large, having a diameter of 1.8125 inches. A pressure feed lubricating system is used, a gear oil pump driven from the rear end of the camshaft forcing the oil directly to the bearings. The pressure can be regulated by an instrument on the crankcase. The magneto is a Bosch high-tension type and the carbureter is a Zenith. The intake manifold is cast so that it is attached to the crankcase. The clutch is an all-steel multiple-disk, operated through a cam, which greatly reduces the pressure necessary to disengage it. Gearshifting is accomplished by pressing buttons which send an electric current through solenoid coils, thus exerting the pull on the shifting mechanism necessary to make the gear changes. The U. S. L. starting and lighting system is furnished on this car, being incorporated in the power plant in the usual manner, in this system the starting motor taking the place of the flywheel. The same rear axle is used as in the past season, this being a semi-floating type with a cast steel housing, and brake brackets having the axle tubes shrunk in place without rivets.—S. G. V. Co., Reading, Pa.

### Simplex Markets Three Fours

Three four-cylinder models, rated at 38, 50 and 75 horsepower, will be put on the market by the Simplex Automobile Co. On the 38, four types of touring bodies, a four, five, six and seven passenger, two limousines and two landaulets are fitted as stock designs. Roadster bodies and other designs can be secured on any of the chassis on special order. All three Simplex models have T-head motors supported at four points, dry-disk clutches located in the flywheel, and four-speed gear boxes mounted amidships and supported at four points.

To take up the models separately, the 38 has a bore of 4.875 inches and a stroke of 6.5 inches. The cylinders are cast in pairs and have separately cast manifolds with the intake on the right side and the exhaust on the left. The motor is water cooled, a honeycomb radiator being used in connection with a centrifugal pump. Dual ignition is used, a Bosch high-tension magneto supplying the running current. The balance of the electric equipment is a Rushmore installation of the 6-volt type, operating with a single-wire system. The gasoline system is composed of a 28-gallon pressure tank and a Simplex carbureter. A shaft with bevel gear reduction of 2.75 to 1 on fourth speed or direct is used and the drive is taken through a torsion tube. The chassis weight is 3,600 pounds and the wheelbase 137 inches.

The 50-horsepower model, which is new this year, has a bore of 5.375 inches and a stroke of 6.5 inches. General design, position of the valves, etc., are very similar to the smaller model described above. The ignition, gasoline and electric systems are of the same nature. The drive is by double chains, incased, or by shaft. The propulsion thrust is taken through the radius rods with chain drive and by torsion tube in the shaft.

The 75-horsepower model has the same size cylinders as the 50-horsepower type, but owing to the fact that larger valves and manifolds and an altered cam design are employed, a motor of high power and high speed is produced. Ignition on this model is dual double, two sets of spark plugs being provided. The gear reduction is the same as on the 50, 2.13 to 1 being used on high or direct. Chain drive in 124-inch wheelbase; chain or shaft in 137-inch wheelbase.—Simplex Automobile Co., New Brunswick, N. J.

### Spaulding Radically Refines Bodies

Radical body changes and minor mechanical changes are to be noted in the single Spaulding chassis. The model of the pre-

vious year known as the G has been renamed model H, the addition to the line of a sleeping car body which will allow of the transformation of a conventional appearing touring car into a sleeping car in a few minutes' time, is the feature. By dropping the hinged back of the front seat ample space is exposed for comfortable sleeping quarters. To make an over night stop on the road enjoyable there is provided an electric reading lamp. Three point motor suspension instead of four now is used.

The regular touring body made entirely in the plant of the Spaulding Mfg. Co., Grinnell, Ia., will allow 4 inches more room over the back cushion and will have an instrument board on the dash. Streamline has been the word in Spaulding body design and this has been worked out more successfully this year than ever before. The cowl arrangement has helped this considerably and the placing of one gasoline tank in the rear and another in the cowl has augmented this. The fuel feed then is first by pressure from the rear tank to the cowl tank and then by gravity to the carbureter. The rear tank is hung low between the side rails of the frame and its transposition to the rear has permitted of the use of an 11-inch cushion in the front, the same depth cushion being used in the rear.

The four-cylinder motor of 4.25 by 5.5 inches remains unchanged except for suspension as does the running gear. Left drive and center control are continued with the Gray and Davis starter.—Spaulding Mfg. Co., Grinnell, Iowa.

### Speedwell Continues the Six

The Speedwell six marketed last year under the title of series G has been continued with minor refinements and is now known as series H. The one chassis is fitted with a full line of body designs. The motor dimensions remain the same but some small refinements have been made on the remainder of the chassis. The rear axle has now been fitted with a housing that incloses the torsion tube springs whereas last year they were left uncovered and the end of the torsion rod which was flat where it passes between the springs is now fitted with a ball. A safety strap has also been fitted to prevent the torsion rod from falling to the ground in case the front end should become loose.

While the price of the car remains the same as last year it is a better value on account of the more complete equipment. This year a two-cylinder power tire pump, battery indicator, Warner speedometer, oil feed indicator, quick-detachable storm curtains, and gearshift lever lock are added to the regular equipment which is sold with the car.

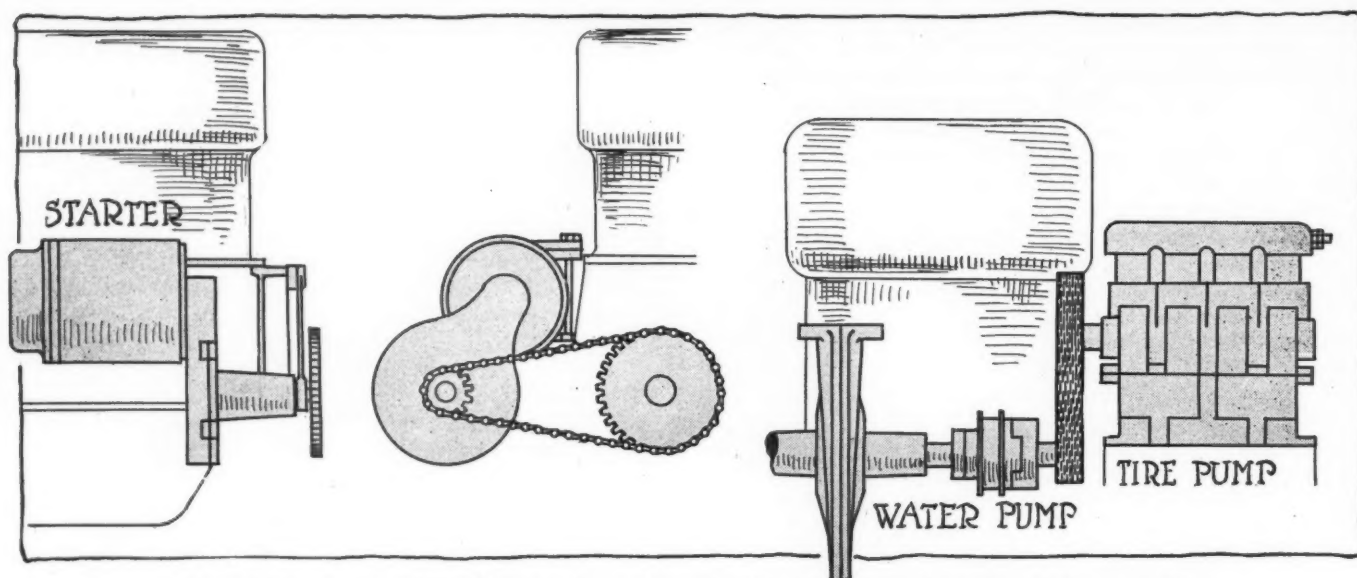
The 4.125 by 5.25 power plant is distinguished by its unit construction and three-point suspension. The cylinders are cast in pairs and have their water-jacket heads removable. The electric equipment includes a Wagner starting and lighting system and a Bosch dual ignition system. The battery is a Willard, charging at 6 volts but discharging at 12. The Wagner generator charges the battery at a maximum rate at car speeds between 15 and 18 miles an hour.

A distinguishing feature of the car this year is the heavy work around the fenders and parts that are generally of lighter construction. Nothing is carried on the running boards, the battery and tool compartments being concealed.

Timken axles are used both front and rear and heavy nickel steel for the steering knuckles.

### Spoerer Marketing a Four

Under the name of model 40 the Spoerer company is making a four, having 4.875 by 5.5 inch cylinders cast in pairs. The cylinders are T-head having the intake valves on the right and exhaust on the left. The motor is cooled by a centrifugal pump which sends the water through a honeycomb radiator. The oil is strictly pressure fed, none of the bearings depending on splash, separate leads taking the lubricant to all bearings. The oil is circulated by a gear pump. A Stromberg carbureter is used, the gasoline being drawn from a 22-gallon tank located at the rear of the chassis and operating under pressure feed. The ignition system is a Bosch dual Z-R four type and starting is by the Gray



Side and front views of Studebaker starting motor connection. Winton water pump and tire pump drive

& Davis system, a compression release being used on the exhaust valves. Electric lighting is provided by the Esterline system working in conjunction with a Willard storage battery, through a double wire system at 6 volts. The clutch is a leather cone carried in the flywheel and the gearbox supplies three forward speeds. Right control and right steering is used. The rear axle is floating and is a bevel type having a 3 to 3.5 to 1 reduction and transmitting the drive through radius rods. The wheelbase of the chassis is 120 inches and 37 by 4.5 tires are used all around.—Carl Spoerer's Sons Co., Baltimore, Md.

#### Stearns Bodies in Streamline Mold

The two Stearns chassis models, a six and four, will be continued and this year left drive and center control will be used. A steering column control board which is always under the hand of the driver has been fitted from which everything about the car but the starter may be operated. Another feature of this year's line is that in the four-cylinder model the rear axle gearbox has been discontinued and instead will be fitted amidships.

This year's car appears with clean running boards and a streamline form of body which tends toward the European in appearance. To the body line has been added a three-passenger roadster. Changes in the equipment include dropping of the bulb horn and in its place a Klaxon is fitted and a pantasote is used instead of the silk mohair.

The power plants for the six and four measure respectively 4.25 by 5.75 and 4.25 by 5.5 inches. They are both distinct designs of the Knight engine but that in the four differs more from the standardized design than does the six. The sleeve travel in the small engine is but 1.125 inches, approximately a tenth of the piston travel. This slow movement affords but little wear. Both models use disk clutches but in the six a four-speed gearbox is used while in the four there are three speeds.

Starting and lighting is by the Gray and Davis system in which the generator and starting motor are separate. The cranking motor operates through reduction gearing to the flywheel. The cranking motor is carried on a bracket back of the engine and bolted to the frame. The generator is driven by silent chain from the magneto shaft. Wire wheels are offered as an option.—F. B. Stearns Co., Cleveland, O.

#### Stevens-Duryea Six in Two Wheelbases

The series C-Six chassis is marketed this season by the Stevens-Duryea Co. This chassis is made in two wheelbases, 131 and 138 inches. Six types of body, a two-passenger road-

ster, five-passenger touring car, three-passenger coupelet, five-passenger Landau-Phaeton, five-passenger Demi-Berline and a seven-passenger limousine are mounted on the 131-inch wheelbase. On the 138-inch wheelbase four types of body are fitted, these being seven-passenger touring car, seven-passenger Landau-Phaeton, seven-passenger limousine and seven-passenger Berline. The price range is from \$4,550 for the two-passenger roadster and five-passenger touring car up to \$6,200 for the seven-passenger Berline.

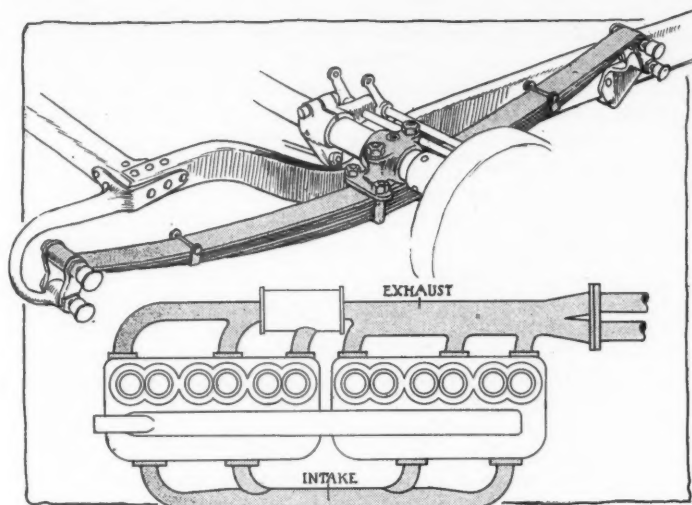
The motor has six cylinders and these are cast in pairs. The bore is 4.9375 and the stroke 5.5 inches. The Bosch two independent ignition system is used and the Stevens-Duryea water jacketed carbureter. The motor is oiled by combination pressure and splash system and is fitted with electric lighting including a generator mounted on the forward left side of the engine. The cranking system fitted on this chassis is operated by air pressure, the air being released by a valve located on the instrument board before the driver. The clutch is a multiple-disk dry plate and delivers the power to a sliding selective gearset having three forward speeds. The gearshift lever is what is known as the self-finding type. A bevel gear rear axle is used. It is floating and has an axle housing and seamless axle tubes. The lower members of the rear spring are below this axle.

Wood wheels are fitted as standard on all models, but the Rudge-Whitworth detachable wire wheels are offered as an alternative at an extra charge of \$200 per car. The tires fitted on all models on the 131-inch wheelbase are 4.5 by 37 inches with the exception of in the demi-Berline and limousine, where 5 by 37-inch tires are used. On the 138-inch wheelbase chassis all cars are regularly fitted with 5 by 37-inch tires. When wire wheels are specified they come with the Houk detachable feature. Exceptionally fine body work is a feature of Stevens-Duryea cars and they are all quoted at an inclusive figure as regards equipment, with the exception of the wire wheels.—Stevens-Duryea Co., Chicopee Falls, Mass.

#### Studebaker Drops Three Fours

Standardization of product is the keynote at the Studebaker plants for 1914, and in line with this policy, the number of different models has been reduced to two a four and a six. Last year four four-cylinder types were offered in addition to the six. Both the new six and the new four have motors of the same cylinder dimensions of 3.5 by 5. Studebaker outward appearance has been altered somewhat to bring the bodies up to latest design. The most noticeable outward change is the sloping hood, which at the rear meets the sloping cowl without break. The Six body has been enlarged to seven-passenger capacity.





Regal underslung semi-elliptic rear. Packard exhaust and intake manifold

The most prominent mechanical change in the new Studebakers is the shifting to left drive and center control, whereas the cars heretofore were driven from the right and control levers were also on the right. Another important change is the placing of the gasoline tank under the cowl instead of having it under the front seat. Thus although gravity feed is retained, it is made much more positive by this raising of the reservoir position, allowing the carburetor to be raised and made more accessible and shortening the intake manifolding.

Both the Studebaker four and the Studebaker six now carry full Timken roller bearing equipment. Each car is fitted with thirteen of these bearings. The six body has been enlarged to seven-passenger capacity. The four is not fitted with a full floating rear axle and has a wheelbase of 108 inches. Gray & Davis lamp equipment is provided throughout.

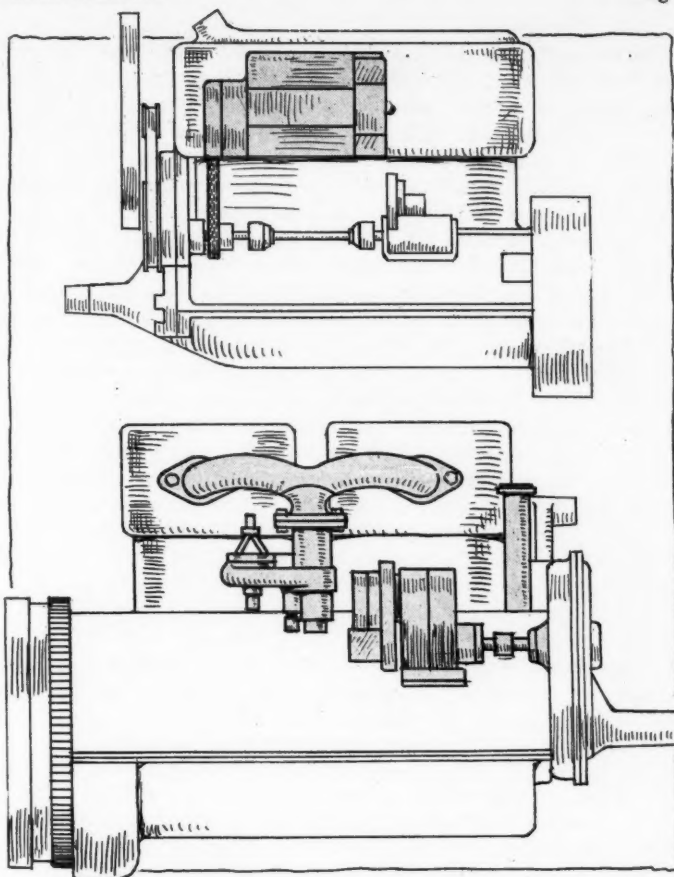
Two special bodies are offered this year in addition to the touring cars and roadsters. These are the landau-roadster and the sedan. The latter is furnished only on the six chassis. Prices for the four-cylinder cars are not comparable with any of last season since the four is a brand new model. But referring to model 135, its nearest corresponding type of last year, the figure of \$1,050 which is asked for the four in touring and roadster designs is \$240 lower than the corresponding body types of this model 35. The six prices remain about the same as in 1913, \$1,575 being the figure for standard bodies.

The motors are L-head, block-cast designs, with valves on the left. Though conventional poppets in most respects these motors have an unusual feature in the transverse shaft at the front end, driven by a helical gear from the camshaft gear, and operating at its left end the centrifugal water pump and at the opposite end the ignition distributor. The bearings in these motors are the same where consistently possible, the four crankshaft having three and the six four main bearings.

Lubrication is by combination force feed and splash, while electric cranking, lighting and ignition are taken care of by the same electrical system as last year. This is of the Wagner make, but the form is altered in that the electric motor and generator appear as separate units instead of being a combination unit. They are placed on opposite sides of the power plant, making a balanced construction.

The Studebakers have cone clutches and gearsets in unit with floating rear axles.

The spring suspension of the four is new to Studebakers in that the rear springs, which are elliptic are underslung from the axle. The six has three-quarter elliptics in the rear which are overhung. Tire equipment of the four is of the 32 by 3 1-2 inch size, while the six has 34 by 4 inch tires. The wheelbase of the four is 108 inches, and that of the six 121 inches.—Studebaker Motor Corp., Detroit, Mich.



White motor-generator mounting. Mercer magneto and carburetor mounting

### Stutz Has Interchangeable Motors

A single chassis upon which a six and four-cylinder motor are interchangeable is the unusual feature of Stutz cars from the factory of the Ideal Motor Car Co. The new line is known as series E; the 1913 was series B. On account of the two different motors employed the line is listed as two chassis.

The new six-cylinder motor and the new four-cylinder motor are interchangeable insofar that they go under the same length of hood, and aside from the motors the four-cylinder and the six-cylinder cars are practically identical. The chassis are equipped with the same bodies.

Accomplishment of the feat of putting a six-cylinder motor under the same length of hood as the four has been made possible by casting the cylinders in sets of three instead of pairs as was done in the 1913 sixes. The new six is a little smaller than the original six which appeared in August, 1912. It has a bore of 4 inches while the older one was .25 inch greater in cylinder diameter; the stroke, however, was the same, 5 inches. The four cylinder-motor has the same dimensions as the old four, 4.75 by 5.5 inches, and the cylinders are cast in pairs.

A unique feature of the motor is the method of inclosing the valve mechanism. Each pushrod and valve spring is inclosed separately by an aluminum housing split in the center. Electric cranking system consists of a separate motor and generator outfit designed by Harry Stutz, built by the Remy company. Another of the new features is the combination breather pipe and oil filler in which the air from the breather is directed downward. The prices remain the same as previously at \$2,000 and \$2,250 for the four and six-cylinder roadsters, while the touring cars are \$2,150 and \$2,400 for the four and six, which is an advance of \$150 and \$100, respectively, over 1913 list.—Stutz Motor Car Co., Indianapolis, Ind.

### Touraine Chassis Two Lengths

For 1914 Touraine cars will be built on two lengths of wheelbase chassis, there being mounted upon the 124-inch wheelbase

chassis a two-passenger, four-passenger and five-passenger body, the two-passenger and five-passenger bodies being stock and the four-passenger bodies being built to order. Upon this same wheelbase is also offered a raceabout and inside driven coupé, in addition to special model 114-inch wheelbase built up as a raceabout only. On the 134-inch wheelbase is mounted a seven-passenger touring car, victoria, limousine and landaulet models. All chassis are similar mechanically in that they are equipped with a six-cylinder unit power plant motor.

The motor cylinders are cast in threes and are of T-head shape with a bore of 4 and a stroke of 5.5. The maker's rating of this motor is 61 horsepower at a speed of 2,220 revolutions per minute. The intake valves are located on the right and the exhaust valve on the left side of the cylinder casting. Both camshafts are driven by spiral gears. The lubricating system used is a circulating splash operated by a gear pump and the water cooling system is operated by a centrifugal pump which forces the water through a honeycomb radiator. For ignition a Bosch dual system is provided. The gasoline system is a pressure feed with the gasoline tank swung on the rear. The capacity of the tank is 22 gallons and is used in connection with a 1.5-inch Flechter carbureter. Gray & Davis electric lighting and cranking system is installed and the storage battery which provides current for cranking the motor and operating the lights is a 6-volt Willard of 160 ampere-hours capacity connected up with the double-wire system.—Touraine Co., Philadelphia, Pa.

#### Traveler Made in a Single Chassis

A six-cylinder chassis which is distinctly in the \$2,000 class listing exactly at that price in the five-passenger and two-passenger bodies has been put out by the Traveler company under the name of 48. The power plant is the Continental Light Six, 3.75 by 5.25 motor which provides a unit plant suspended at three points. The water circulation is maintained by a centrifugal pump and Mayo honeycomb radiator with German silver casing. Ignition is provided by the Bosch system.

A Brown-Lipe multiple-disk clutch with copper Raybestos facing, transmits the power to a three-speed selected Brown-Lipe gearbox with chrome-nickel gears, providing a drive of 3.9 to 1 on third which is direct. The rear axle is a Timken floating and the front axle a Timken I-beam. Left drive, center control, the details of which are standard is furnished on this model, the chassis weight is 3,000 pounds, the wheelbase 130 inches.—Traveler Motor Car Co., Detroit, Mich.

#### Tribune a New Entry to Field

Specializing on a five-passenger touring car with a four-cylinder motor, selling at \$1,250, the Tribune company has recently entered the automobile field. The touring car is a roomy five-passenger type designed along conventional lines and incorporate a four-cylinder, 3.75 by 5.5 Buda motor. The L-head cylinders are cast in a block and mounted at three points. Distinct features in the design of the motor are the three-bearing crankshaft, long pistons and accessible bearings, which may be reached by dropping the oil pan. Lubrication is by combination force feed and splash in which the oil is kept at constant level. Cooling is by water circulated by a centrifugal pump. Bosch dual high-tension ignition is furnished, together with Bosch plugs.

Two sets of brakes lined with Raybestos and providing 320 inches of braking surface are provided. Frames are single-drop, the steering gear a Gemmer, worm and full gear, and the ball-capped gear lever and emergency brake lever are attached directly to the gearbox. Wire wheels are specified on this car when desired. The gasoline tank is located under the front seat and has a capacity of 10 gallons. An auxiliary tank is mounted under the cowl and has a reserved capacity of 8 gallons. A feature of the control system are the pedals which are adjustable for length.—Tribune Motor Co., Detroit, Mich.

#### Vaughan Has Distinctive Streamline Body

The Vaughan is a new six-cylinder car distinguished by several special chassis features and by a new adaptation of the

streamline form made possible by the use of a high, narrow radiator. The motor forms part of a decidedly unit power plant, the cylinders being cast in a single block and the gearset and clutch being incorporated in an extension of the crankcase. It is a six-cylinder L-head design, having a bore of 3.75 and a stroke of 5.5 inches. The valves are on the right, permitting a clear space for the steering gear which is mounted on the left. The pressure gasoline system is used and the tank is slung on the rear of the chassis in steel straps, hung from an extension on the frame. The capacity of the tank is 22 gallons, and pressure is maintained by a Hancock air pump built into the motor. The electric equipment consists of a Mea magneto and a Bijur 6-volt electric lighting and starting system. For ignition the magneto alone is relied upon, as the electric cranking motor rotates the crankshaft at 115 revolutions per minute. The electric motor engages with the flywheel by means of a worm and traveling gear which is automatically carried into engagement when the electric motor starts and thrown out when the engine starts to revolve. A 100 ampere-hour Willard storage battery furnishes the current for starting. The body work on the Vaughan cars is highly distinctive, the narrow radiator has permitted the designer to carry the streamline form without a break from one end of the car to the other. The bonnet line is carried up with a slope to the cowl, at which point there is a slight upward curve which breaks into an easy downward sweep and thence flows back in a straight line along the tops of the doors, terminating with a sweep at the back of the tonneau. The doors are exceptionally wide, measuring 24 inches, and additional space is gained at the rear by allowing the body to extend over the wheels, providing in the touring car a rear seat width of 43 inches.—Vaughan Car Co., Kingston, N. Y.

#### Velie Enters Six-Cylinder Field

Velie products for the new season are marked by their entry into the six-cylinder field, although the four-cylinder cars which heretofore have formed the regular output of the Velie company will be the leaders. The line for the coming year embraces two fours and a six. The two former are developments of earlier chassis. One of these is called the model 5, and is a development from the 4-32 of the past season, and the other, model 9, which is a development of the 4-40. The six-cylinder model is known as the 6-50, and is new throughout. A few sixes have been produced by the Velie factory in the past, but not as stock product.

Model 5 has cylinders 4 by 5.5 inches in size, which is an increase of 1-4 inch in the bore, the stroke remaining the same. Model 9 is 4.625 by 5.25, which is a .125-inch increase on the bore over the 4-40 of 1913. The six-cylinder is a Continental engine 3.75 by 5.75, and is the only engine not purely a Velie product.

Chief among the constructional changes on the two four-cylinder chassis is the extension of the Gray & Davis cranking and lighting equipment to be included as stock equipment on all three models instead of only on the larger four, as obtained during the early part of the closing season. Also in the smaller four the fuel system has been altered slightly by the addition of a small .5-gallon auxiliary gasoline tank. Changes on the larger four, model 9, include the removal of the fuel tank from its former position under the front seat to the rear axle, and the installation in the gasoline line of a special fuel strainer under the hood.

Model 9 is the one typical of Velie design and incorporates more of the Velie features. The motor itself is an L-head design with the cylinders cast in pairs.

Model 6-50 is almost identically the same design except the motor. From the engine back the larger four and six are identical. It has a Continental engine with its cylinders cast in threes. Model 5 differs from the larger four in the block casting of its cylinders, in the arrangement of its timing drive, which, however, is a silent chain, as in model 9. Cooling is by thermosiphon. In the little four the fuel tank is under the front seat and is gravity feed instead of pressure feed.



An arrangement for the automatic alignment of the magneto with its chain drive is provided. When slack in the chain is to be taken up, this is done by moving the magneto chain sprocket. To prevent having to realign the magneto the sprocket is mounted upon an electric bushing and the adjustment of the chain is by moving this bushing without disturbing the magneto itself. This is a new feature for which patent has been applied by the Velie company. Bodies of the new Velie cars exemplify the present trend for straightline type and clean running boards and graceful contours.—Velie Motor Vehicle Co., Moline, Ill.

#### Vulcan Offers Low-Priced Four

The Vulcan 27, a new car, is made entirely in one shop and makes its way to the low-priced field. A roadster is being offered at \$750 and a touring car at \$850. The motor is in the true long-stroke class having dimensions of 3.375 by 5. Single ignition, thermo-syphon cooling, and 1-inch carbureter are used. The drive from the motor is through a cone clutch and thence through a three-speed selective gearset to a semi-floating rear axle. The wheelbase of the roadster is 105 inches, that of the touring 115 inches. Left drive and center control are used, and the tires are 32 by 3.5 inches all around. At the prices mentioned full equipment is given.—Vulcan Manufacturing Co., Painesville, Ohio.

#### Wayne Carries Three Models

The Wayne Works of Richmond, Ind., is carrying three models, two of them fours and the other a six. The chassis on the three models are the same except that the six has a wheelbase of 123 inches, the 40 of 117, and the 35 of 114. The same bodies are fitted to all three models and the equipment includes Jesco electric lighting and starting, engine-driven tire pump, extra rim and tire hangers in the rear, concealed tool boxes, top and curtains, clear vision windshield, and 30 by 4-inch tires. No dash lights are carried, the headlights being equipped with dimming arrangements.—Wayne Works, Richmond, Ind.

#### Westcott Continues The Six

Continuing its six-cylinder with a few refinements, principally affecting the body, the Westcott company has brought out an entirely new four of 30 horsepower. The motor is of the L-type, with its 3 1-2 by 5-inch cylinders cast in block, and with a three-bearing crankshaft. The lubrication is effected by means of a self-contained force-feed constant-level splash oiling system, with the sight-feed on the motor. The clutch is a leather-faced cone and the gearset a three-speed. The Jones lighting, ignition and starting system is employed. Springs are semi-elliptic both front and rear, while the rear axle is semi-floating and the front 1-beam drop-forged. The 12-gallon gasoline tank is placed under the front seat and the wheels carry 33 by 4-inch tires. The bodies are streamline and come in two and five-passenger sizes. The list on the new four is \$1,385.—Westcott Motor Car Co., Richmond, Ind.

#### White Adopts a New Clutch

The White Company announces the retention in 1914 of all three-passenger car chassis, Thirty, Forty and Sixty, with new and highly developed body designs for all touring and enclosed cars and a number of important improvements in chassis and appointments.

The prices remain unchanged, although the improvements give each model a higher relative value. The five-passenger 30 lists at \$2,500; the seven-passenger 40 at \$3,500 and the seven-passenger 60 at \$5,000. Enclosed bodies have been redesigned along advanced ideas of coach car refinement.

One improvement which applies to all cars is the use of a single plate clutch running in a bath of oil instead of the leather-faced clutch used heretofore. Another improvement which is embodied in all models affects the cooling system. It has been further developed by a new design of water passage from the top of the water-jackets to the radiator, combining the jacket cover-

plate and the outlet pipe in one integral forging. The honey-comb radiators are of larger size and capacity, and the top line of the bonnet is on a level with the top line of the body.

The wheelbase of the Forty has been lengthened from 120 to 124 inches and the stroke of the motor has been increased from 5.75 to 6.375 inches, the ratio of stroke to bore being 1.5 to 1.

The long stroke monobloc motor, electrical starting and lighting system, left side drive, center control and four-speed transmission are still the conspicuous features of the White line.

The new touring bodies are built on long straight lines with a full curved rear. The dash has no cowl. Instead, the top line of the bonnet and body extent in an almost unbroken straight line from radiator to rear seat, and the top line of the body is marked by a wide moulding carried entirely around the sides and rear of the car. All fittings such as door handles and hinges are invisible.

The White coach cars, in addition to having improved vehicle lines, embody a number of new appointments. The Berline limousine has a two-way telephone with receivers and transmitters in the rear compartment and on a pillar beside the driver. The outside pillar lamps are of a new design having reflectors for illuminating the step in addition to the light from the step lamp. An eight-day rim-winding and rim-setting clock and an electric cigar lighter of imported design are also included.—The White Motor Car Co., Cleveland, O.

#### Winton Adds Left Drive

The Winton six announced this season differs from its predecessors more than was the case with any of the earlier cars. Left steering and center control are the cause for a number of changes which differentiate it from predecessors.

Among the foremost of the other alterations is the lengthening of the stroke .5 inch, so that it is now 5.5 inches, although the cylinder bore remains at its old figure of 4.5. By dropping the frame at the rear, both motor and body are given a lower suspension, amounting to 4 inches. The clutch release has been lengthened slightly to insure that there be no dragging and to increase accessibility.

Other alterations are more in the matter of equipment, the most noticeable of which is the absence of side or dash lamps. These are replaced by two bulbs in the head lamps. The pneumatic cranking system which has been a feature of the Winton car for many years has been altered by the addition of a four-cylinder Kellogg pump, which supplies the air for tire inflation and also acts as a supplementary power plant for the air-cranking supply. No change has been made in the original system except in the connections to the two-way valve on the dash.

Some of the other new features of equipment are the mounting of the clock, speedometer, coil, switches, etc., on the cowl board, German silver finished radiator and the nickeling of other exposed parts. A primer from cowl to intake manifold and a hot-air tube to the carbureter have been added.

In general the Winton for 1914 is a six-cylinder car with L-head cylinders cast in pairs, a multiple disk clutch, four-speed gearset, floating axle, 130-inch wheelbase and 36 by 4.5-inch tires. Eight different types of open and enclosed bodies are fitted as stock.—Winton Motor Car Co., Cleveland, Ohio.

#### Zimmerman Making a Six

Under the model name B-6 the Zimmerman company is making a six-cylinder car rated at 55 horsepower. While no four-cylinder models are listed, there are models D and E which are of the two-cylinder variety rated at 20 horsepower. The six-cylinder chassis follows conventional designs throughout, having a choice of left or right drive and center control. The power plant is a 4 by 5, having the L-head cylinders cast in pairs and the chassis is provided with a disk in oil clutch and three-speed gearset. Remy dual ignition is used, a compressed air or electric starting and lighting system is provided and the car is sold equipped on a 132-inch wheelbase.—Zimmerman Mfg. Co., Auburn, Ind.



# The Engineering Digest



## Casehardening and Its Status in European and American Shops —Peculiarities with Alloy Steels

**D**IFFERENCES in the wage scale and in the need for rapid production methods have been among the factors which have placed casehardening in a less important relation to automobile manufacture in the United States than that which it occupies in Europe, and which it also occupied here until a few years ago, when it was generally discovered that the use of certain alloy steels, which can be made hard enough as well as strong enough by a heat treatment taking only a small percentage of the time required for casehardening, fitted better into the manufacturing routine and produced results which were more uniform than those obtained from casehardening of any special steel by average workmen.

If it were not for the large and cumbersome plant of muffle ovens, the difficult boxing of the work and the need of a sharp system for watching the time given different sizes and shapes, casehardening might, however, still hold its place for many purposes for which it has been discarded, as neither economy nor quality of the output is decisively in favor of the rapid heating and quenching method in all instances. Usually the steels adapted to bring good results with the rapid method cost two to three times as much as the steels adapted to bring equally good or much better results by scientific casehardening. In addition the quenching-steel costs much more to machine, being tougher and harder in its natural state, and wherever the actual cost per piece is of greater importance than the uniformity of working processes or simplicity of the routine, the amount of machining involved in each piece of work should usually be the decisive item on which to base a preference for one method or the other. A comparison on economical grounds is in fact very difficult, and probably the best answer to the questions which arise is that given through the actual development of shop practice, according to which many specialty manufacturers, among whom gear cutters may be included, still employ casehardening to a considerable extent wherever it is important to have a relatively soft and yielding base or core for a working part which should hold its shape and smoothness indefinitely in hard service, while, on the other hand, manufacturers whose productions cover a wide scope of different articles, to be pushed through to the assembling rooms at about the same rate of speed, so as to get there at the same time and not encumber the stock room, generally work with quenching-steels which are furnished in the market at medium prices, the machining of which is not excessively costly and which give medium results with regard to hardness and durability; by selecting dimensions a little larger than would otherwise be necessary and designing forgings and castings so closely that the machining is reduced to a minimum, they are nevertheless enabled to give good values.

Those who still contend that casehardening is likely to hold its own in the long run may point to the fact that the rapid methods, rather than becoming simpler, have become more complicated and less rapid through increased experience, with a view to improving the results generally and especially avoiding internal tension, cracks and immediate or subsequent distortions; two heats, two annealings and two quenches at different temperatures being now commonly required. They may also

point to such a parallel as the history of the hammer. Scarcely any hammers are now made in which the neck of the handle is not thinned so as to make a blow more or less elastic. The world's approval of this feature in hardened hammers has been general and decisive—largely, of course, because a hammer is handled directly by man and even slight differences in the action are noticed—and it seems reasonable to suppose that the very similar feature of superiority in casehardened steel, due to the providing of a yielding base for a sharp blow, in the course of time will be found indispensable for the highest quality. For all who share this idea, a very complete encyclopedic treatise on the data of casehardening occupying 49 pages in *Revue de Mécanique* for November should be of interest. Among the great variety of details, of which perhaps the majority, however, are of scientific rather than of practical interest, a few of those relating to special steels may be summarized here.

### Alloys Which Hinder or Help Casehardening

According to Guillet, those elements which can form carbides with the cementite of steel facilitate cementation. Such are chromium, tungsten and molybdenum. But elements which remain in solution in the iron retard cementation. These are, for example, nickel, silicon, aluminum, vanadium. No steels are made for casehardening containing more than 6 per cent. of nickel, 2 per cent. of chromium or .8 per cent. of manganese. The casehardening of special steels should be studied from another point of view as well as with reference to the amount of carbon forced into them; namely, with reference to structural modifications of the steel. In carburating manganese, nickel or chrome steels, it is possible to obtain by a simple treatment [specified in the treatise] changes in structure from martensitic to austenitic. By starting from a perlitic or ferritic steel of this class and in which the carbon is very low, the cementation will first give a hard and brittle martensitic steel but by continuing at a higher temperature an austenitic steel of relatively small hardness will be formed. One can take advantage of such peculiarities to produce certain desired effects. If superficial hardness is wanted, the high heat producing the austenite should be avoided; or, if quenching after the cementation is required, one should avoid the martensitic structure, because this by quenching will change into austenite. If, on the other hand, it is resistance to wear which is wanted, the austenite structure will provide this quality in the highest degree, and the simple treatment producing it gives results equal to those for which otherwise a special high-priced steel would be required. If it is desired to avoid quenching, with a view to possible deformation, one simply stops at the heat producing the martensitic structure.

Austenitic nickel steels have the peculiarity that the carbon introduced in them diffuses itself at atmospheric temperatures. A bar with a carbon content of 1.20 in the surface layer goes down to .85 in six months while the carbon content in its interior portions increases correspondingly.

A steel with more than .70 per cent. of vanadium [but the maximum in practical vanadium steels is .30] does not harden by quenching after cementation.

A couple of practical suggestions seem worth repeating.

If it is the intention to quench the work when it is taken out of the boxes, without allowing it to cool and subsequently reheating it and without resorting to two heats and two quenches—to make sure of avoiding a brittle core or a brittle surface—the temperature employed should not exceed 900 degrees centigrade, and the time necessary for producing a film of the required



thickness at this lower temperature should be allowed. Double quenching, on the other hand, admits of cementing at 1,000 degrees and higher at which the cementation takes place much more rapidly. But if a temperature of 1,150 degrees is reached a surface layer of cast iron is formed which ruins the work for machining. When tool steel is made by cementation such a film is produced, but it is cracked off in the subsequent forging without leaving the steel underneath it any the worse.

The penetration of carbon is not the same in work of different sizes and shapes. Under identical conditions the carbon enters less deeply into the surface of a large cylindrical piece than into that of a small one and still less deeply into a plane surface. This phenomenon is of the greatest importance as it practically means that every projecting portion, every angle of a mechanical piece, receives far more carbon than the sides, unless precautions are taken to prevent this effect. Frequently the corners of gear teeth are brittle for this reason.—From *Revue de Mécanique*, November.

## Total Avoidance of Flames and Sparks From Gasoline Motors

WHILE the coincidence of circumstances which may cause the ignition of gasoline in the drip pan or on the outside of an automobile is exceedingly rare, even if the vehicle is turned upside down by an accident, it should after all be altogether impossible. This view has been brought home to the Germans through the sudden conflagration in midair which destroyed a Zeppelin airship with many notables on board and was ascribed to the ignition of gases escaping from the huge reservoir and meeting a flame or spark finding a vent to the exterior from one of the motors. It is reasoned that any provisions which shall absolutely prevent flames or sparks from finding such a vent must obviate the ignition of either gas or gasoline and that provisions of this nature therefore are absolutely needed for dirigible balloons, while at the same time they should be very acceptable for automobiles, even if the complication with escaping gases is here not an additional source of danger.

Von Löw, a noted automobile technician, presents the following considerations on this subject:

Flames can only come from the induction conduits and the exhaust pipe, sparks also from the electric ignition apparatus. The ignition of bearing oils or grease can occur only with such low-grade construction that it need not be considered, and the same may be said of the explosion of cylinders.

Flames in the induction conduits are very frequent. With certain carbureters they occur almost every time the vehicle turns to the right or to the left or at rapid accelerations, accordingly as the float chamber is located to the left, to the right or behind the nozzle. They are heard as puffs in the carbureter and can be produced intentionally at any time by giving the nozzle too little gasoline; they are always heard just before the gasoline supply gives out. The reason for them is the slow combustion of a very poor mixture which leaves the old charge still burning when the inlet valve is opened to admit the next one. The flames arising from this cause can be held inside of the carbureter with perfect safety by surrounding the three air inlets—for cold air, heated air and additional air—with close-meshed wire gauze bulbs like those used for the Davy miner's lamp.

Instead of these bulbs many designers choose at first a flat screen placed at the middle of the induction pipe between the carbureter and the cylinder, but, unless the piping is very much enlarged, this arrangement so throttles the motor that the chauffeur removes the screen at the first chance. The bulbs, on the other hand, can be so shaped and arranged that they do not reduce the area of air passage and even so that they facilitate the cranking of the motor [the author means perhaps by connecting them so that they may be heated from the outside].

It is not necessary to consider the sticking of floats and the

flooding of the carbureter which may result from it, as any gasoline escaping to the outside cannot be ignited if the safety bulbs are in order.

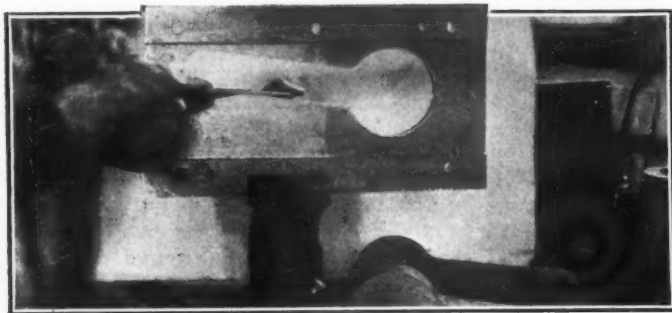
Flames from the exhaust pipe are, in the case of balloon motors, sometimes obviated by water-cooling of the manifold, but the purpose of this provision is only to prevent the manifold from getting red-hot and the effect of it is perhaps overrated, as the cooled stretch is short and leaves the speed of the exhaust gases still so high that much of the cooling nevertheless falls to the share of the exhaust pipe and the muffler, and the exposed metallic surface of these should therefore not be reduced. The whole conduit, including the muffler, should be divided into a large number of compartments, so that a flame under no circumstances may jump to the last of these, even if the whole pipe is filled with explosive mixture. The separation of the compartments both in the pipe and in the muffler is best effected by means of cylindrical connections perforated with numerous holes. It is no doubt feasible to develop experimentally such forms for these connections and their holes that flames will not pass and that also no congestion due to soot deposits can arise. As these connections would have the same purpose as that of the Davy wire bulb—to prevent flames from striking through by cooling them on a large metallic surface—they must of course not be permitted to get red-hot themselves. [Some hesitancy has been shown lately, however, in accepting the theory that it is the cooling of the flame in contact with the wire mesh which prevents it from striking through. The matter might easily be tested out, it seems, by means of a Bunsen burner and a selection of screens—Ed.]

While old-style ignition devices comprised many naked wires from which sparks could easily come, the insulation of the conduits in modern installations is so perfect that sparks never jump to adjacent machine parts, even if one comes quite close to the wires with a metallic tool and the air is full of moisture. The place where sparks may now most easily be generated is at the removable spark plug caps. The old wire terminals at the spark plugs were less dangerous, as nobody took hold of them for fear of the electric shock, but modern terminals are arranged to be pushed on or off, with a view to ascertaining the action of the plugs, and dangerous sparks can occur by reason of this arrangement. These plug controls should—at all events in the case of balloon motors—be especially provided with safety screens, on the same principle that in every magneto the observation spark is placed behind protective screens.

A motor whose ignition organs, exhaust and induction conduits have been worked out in such careful manner can safely be given a wetting with gasoline or otherwise be immersed in an explosive mixture without fear of inflammation.—From *Automobil-Rundschau*, November 30.

## The Inter-Crystalline Cohesion of Metals

WHY are steel and other metals strong, considering that they are of crystalline formation and that apparently nothing hinders the crystals from falling apart? This old conundrum of physical science has been investigated by Rosenhain and Ewen and subsequently by Rosenhain and Humfrey, and the result has been reached that a film of amorphous metal separates and at the same time binds together all the crystals. It has been found that toward the point of fusion, while the crystals still remain intact in form, the amorphous film tends more and more to the so-called undercooled liquid condition in which it yields readily to force. For this reason, when heated metal is broken a photograph of the fracture shows the crystals intact, but cold metal similarly fractured shows the crystals themselves broken. Pure metals and eutectic alloys follow the same law in this respect. These experiments, while they do not exactly explain the cohesion, introduce a new fact which brings the eventual explanation under some general law a little nearer.—From *Institute of Metal*, August, and *Technique Moderne*, December 1.



## The Rostrum

### Car Owners Voice Opinions on Pertinent Topics

#### Driving Don'ts for Careless Motorists

EDITOR THE AUTOMOBILE:—In a former issue of THE AUTOMOBILE there appeared an article commenting on the laxity of some people in the handling of their cars. This leads me to tell of a little experience I had last summer while on a trip in one of the popular light cars.

The steering wheel on this particular car is comparatively small and for that reason does not allow of such good control as a larger one would. The man who drove on this occasion had a way of grasping the spokes of the steering wheel as shown in the accompanying sketch, Fig. 1, thereby reducing the leverage to a point where the steering was anything but secure. Most of the time we were traveling around 40 miles per hour and constantly meeting other cars. In passing these cars, it was often necessary to take the soft dirt at the side of the road. The road itself was none too good for it was slightly rutted and our small tires at that speed made the wheeling quite uncertain. Add to the whole situation, the possibility of a blowout and it can easily be imagined what might have been the outcome.

For the benefit of those readers who are yet unacquainted with the little dangers that are constantly arising on the road and in the city traffic I would like to make a few suggestions that may not be amiss.

- 1—Always keep the hands on the rim of the steering wheel.
- 2—Never steer with one hand unless unavoidable.
- 3—Grasp the wheel firmly at high speeds; you may have a blowout any second.
- 4—Always drive with the feet resting lightly against pedals. In this position you are ready for instant action and a tumble may be prevented. Many accidents are due to the driver's feet

being on the floor where they cannot be gotten into position quickly.

5—When about to descend a hill "feel" the car with the brakes and get it under control before attaining too much momentum.  
East Orange, N. J. N. E. TAYLOR.

#### Is Against the Guaranteeing of Tires

Editor THE AUTOMOBILE:—I was interested in what W. I. Brown had to say against tire guarantees in your issue of December 4. While he puts it a little strongly, perhaps, when he says the prices can be cut in two, there is probably no question as to the tire makers' ability to put their goods on the market at an appreciably lower price without a guarantee. Of what use is a warranty unless to encourage the misuse of tires with the idea of making the company stand for it? By doing away with the guarantee the makers would be able to lower their prices because they would not have to stand the loss due to replacing tires that had been abused. On the other hand the owner who happens to get a poor tire would not suffer because any reputable manufacturer would be glad to replace such a tire. That is to say, if by chance a poor tire passes inspection and is put on the market, there is no doubt but that almost any company would be glad to give a new tire in its place. At the same time this arrangement would eliminate the grafting of those people who really get good tires but obtain a small mileage due to their careless use of them. I believe the practice of guaranteeing a tire is pernicious and tends to higher prices as the makers must have a profit after making the adjustments.

I would like to hear what the makers have to say about it.  
Daytona, Fla. J. W. F.

#### Horsepower Ratings of Various Motors

Editor THE AUTOMOBILE:—I am in the market to buy an automobile and would like you to give me the correct horsepower according to the S. A. E. formula of four-cylinder motors with the following dimensions:

- 1—3.25-inch bore by 5.5-inch stroke.
- 2—4-inch bore by 4.75-inch stroke.
- 3—4.125-inch bore by 4.5-inch stroke.

Aaron, N. C.

JOHN F. SMITH.

—1—The S. A. E. horsepower rating is based on bore only and is given by the formula:

$$h. p. = \frac{D^2 N}{2.5}$$

where D = motor bore in inches  
N = number of cylinders.

According to this formula these three ratings are: 16.92, 25.6, 27.20 horsepower respectively.

#### Stove Pipe Enamel As Brass Paint

Editor THE AUTOMOBILE:—Tell Dr. C. H. King (THE AUTOMOBILE, December 4) that he can paint his brass with any good stove pipe enamel, such as is used on stove pipes, radiators, etc. I painted mine 6 months ago. Heat does not affect it, but a film of kerosene oil from a leaky lamp will soften.

Hollister, Cal.

C. M. CALKINS.

#### Facts on Detroit's Consumption of Leather

Editor THE AUTOMOBILE:—Will you please give me some information concerning the amount of leather used by the different automobile companies in Detroit in a year and also how much it takes and how much it costs to upholster the ordinary touring car?

Long Island City.

F. C. D.

—The Detroit industry has used \$7,800,000 worth of leather this year in addition to the imitation leather which is used by some concerns. The average cost of a hide is from \$42 to \$50



and so it is seen that over 150,000 must have been required. The ordinary touring car takes 125 square feet of leather and as the average hide measures 55 square feet it takes from two and a half to three hides per car. One hide and a half will upholster a roadster, while four are needed to fit out a limousine.

Most of the hides are brought from Chicago and St. Louis and are usually purchased as hides and not as bales, pieces or kips. The latter are small hides or calve skins and are not used at all for the upholstery of automobiles.

Four grades of leather are used, hand buffed, machine buffed, deep buffed and splits, the latter being the lowest grade, while the hand buffed is the best.

### Wants Better Names for Car Parts

Editor THE AUTOMOBILE:—I note that you are taking up the question of better names to car parts. I also note that owing to the number of parts in a motor car it would be quite a difficult matter to illustrate all of them, but there is no reason why they could not be enumerated and numbered.

As manufacturers of a certain line of goods we are compelled and find it expedient to publish, just as soon as any article which we manufacture is placed on the market, a sheet describing and numbering each particular part which goes to make up the particular article and also to publish a list price of these parts.

The necessity of such a parts book for automobiles is well illustrated by the trouble I experienced in ordering new parts when my car was overhauled recently. The work was done by an expert mechanic but who, just like myself, can tell just what part is needed by putting his finger on it, but as far as the name is concerned he does not know the trade name. Therefore I was obliged to make a personal trip to the agent of the manufacturer of my car in this city, rather than send a boy with an order, and then I had to explain by signs and rough drawings to the storekeeper just what particular parts I needed.

Now, when I get a bill for these parts it does not mean anything to me unless I personally have seen the parts so that I can check it up. I have a bill in my hand at present which reads as follows:

15 No. 4066 Stock Slip	
1 W 27 Cam Slide Bushing.....	.80
1 W 181 Cam Slide.....	1.40
4 W 187 Piston Rings.....	3.00
1 7-inch Hose.....	.40
1 W 2084 Bolt.....	.10
8 C 262 Gaskets.....	.40
Total .....	6.10

You can readily see that I have no key by which I can check this bill or the prices and, as a consequence, if I had not personally gone to the manufacturer's agent and received them from his storekeeper in my own hand I would probably have a suspicion that I was overcharged because I didn't know the difference between a Cam Slide Bushing and a Truss Rod.

Philadelphia, Pa.

R. W. ROLSTON.

—Your suggestion concerning better names for car parts is a good one, but the difficulty in the way of its adoption is that there are so many thousand parts in the make up of an automobile that it is hardly possible to obtain intelligible names, names that are easily understood, easily remembered and are not too long, for all of them. Most, if not all, manufacturers issue books, intended for the owner, with all the parts excepting small screws and bolts illustrated, named and numbered so that when a new part is needed reference to the book will readily show the order number and thus the part can be ordered and received without the possibility of a mistake occurring. Quite often the parts catalogue is combined with the instruction book.

The main trouble seems to be that this book does not get to the owner or if it does the owner does not realize what it is; either he puts it away without looking at it and promptly forgets about it or else he throws it away, thinking it to be mere advertising matter.

There are three ways of delivering the all important parts book to the purchaser of a car: it may be handed to him by the agent; it may be placed in the tool box or some other convenient place in the car, or it may be mailed to him, along with a letter calling his attention to the desirability of preserving this book for ready reference. If the first method is employed, the chances are that the agent will forget to turn over the book when the car is delivered. The second plan is open to the objection that somebody is liable to take the book from the car before delivery, either one of the men from the shop will take it just because he cannot find the shop copy or a salesman in a hurry to show some part to a prospective will remove it.

The last plan is the best because the letter that accompanies the book informs the owner of the book's importance and therefore it is taken care of when received. Probably if more concerns used this method of distributing parts books to owners there would be less complaint as most companies take the trouble to publish parts books but the difficulty is, as already stated, that these books do not reach the owners or if they do their value is not appreciated and therefore they are not saved.

### Weak Mixture Causes Engine to Miss

Editor THE AUTOMOBILE:—I have a Maxwell Special that is giving me trouble. It will miss for the first mile or two until the motor gets warm and then it runs fairly well. It is the back cylinder that bothers most. It has good compression and the valves seem to be all right. I had a new coil put on last summer and it was all right for a while. It is equipped with a Stromberg model B Carbureter and type TD Splittorf magneto.

I would like your advice as to whether a high tension magneto would make it act quicker and give more power or is the motor at fault?

Scribner, Nebr.

G. S. G.

—The fact that the missing of your motor ceases as soon as it becomes warm shows that the trouble is not in the magneto as you suggest but in the carbureter. Your mixture is too weak for running while the motor is cold. This is due to the fact that only part of the gasoline issuing from the spray nozzle is vaporized, although when the motor warms up a good mixture is provided because there is sufficient heat to vaporize all gasoline.

Cut down on the amount of auxiliary air supplied at both low and high speeds. The adjusting nuts for doing this are located above and below the auxiliary air inlet, the low speed nut being below. Screw this nut up, or to the right, until the motor runs smoothly with throttle closed. The high speed screw should then be turned up until the missing ceases when running along at a fair rate of speed on high gear, with the motor cold.

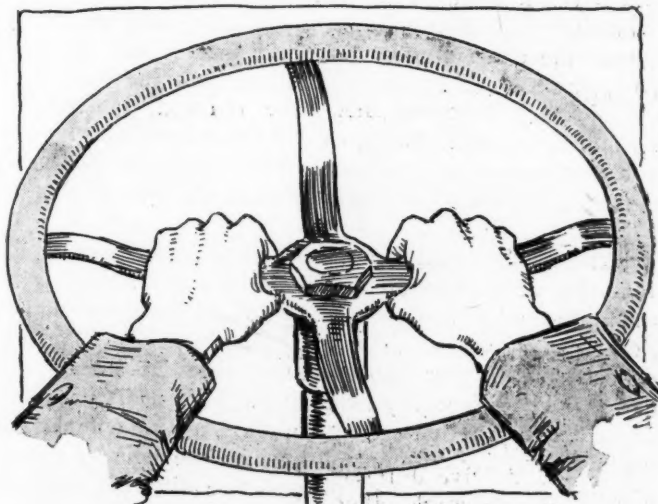
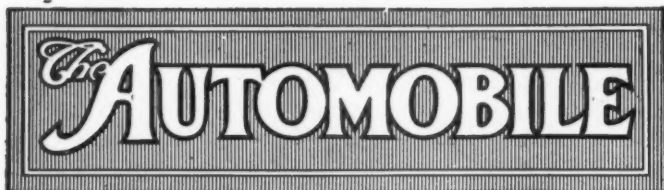


Fig. 1—The wrong way to grasp the steering wheel; this position is extremely dangerous when traveling at high speed because of the small leverage the hands have



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## Economies in 1914 Cars

NOTHING could be more satisfactory than to note the marked strides towards more rational production of motor cars for this year than the new programs of many companies, these programs incorporating many factors which will bring about cheaper production, cheaper merchandising methods and cheaper maintenance to maker and dealer. Of the 145 companies building automobiles this year, only five companies have actually increased the number of models they are manufacturing and selling, leaving 140 that have either retained the same number as last year, or have dropped some models, as is the rule rather than the exception. Of nineteen concerns that have reduced the number of models carried the figures show thirty-three models for this season as compared with fifty-nine last year, a reduction almost equivalent to cutting the number in half.

But these figures do not tell the complete story of manufacturing economy that is effected by this elimination of the multi-model program. The engineer has gone further than bare figures can convey. To illustrate: Take one concern that a year ago built five different models and had as many different cylinder sizes. This meant in manufacture, five different settings of the boring machines for the cylinders, five different settings for the cylinder grinders, five different sizes of pistons, five different sizes of connecting-rods, five different sizes of piston rings, not to mention innumerable other multiplication of parts due to the five different cylinder sizes. But go a step further

and consider the task of carrying spare parts in all of the dealers' places over the country for such a multi-model régime. The dealer in Mexico, if he is up-to-date, must carry his five piston sizes, five connecting-rod sizes, five sets of piston rings, and perhaps five different types of cylinder castings.

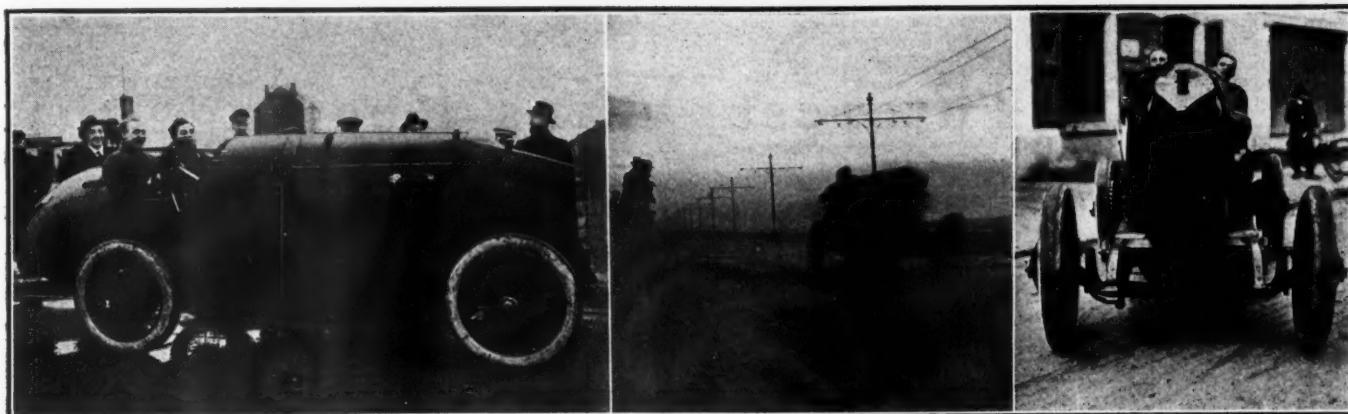
Turn over to the 1914 page of this concern with its two models and note the economy. The designer has used the same bore in both the models, one a four and the other a six, thus the same pistons, and the same connecting-rods and the same piston rings can be used in one as in the other. What an economy this works in the manufacture of the car by reducing the actual number of different parts to be manufactured, and further by the fact that the boring machine for the cylinders will not have to be interrupted in its work from the beginning of the season until the end of it; and further, the grinding machines can continue from July 1 to June 30 of the following year in turning out the one kind of work, no time being lost in changing each week or month from making one size of part to making a different size, which program of change is certain to be followed by errors in workmanship for a time after the change has taken place.

But the economies of this concentration policy in design go further and extend the helping hand to the dealer in Barre, Vt., or Paris, Tex., in that he has fewer parts to carry in stock and enters more whole-heartedly into the marketing of a single model; in a word, he can use intensified sales in contrast with his previous policy of trying to interest every possible buyer in his territory in the car he has to sell. The dealer cannot hope to sell everybody; only a fraction of the business will be his, and that dealer is operating on the best economic basis who carefully selects his clientèle and uses the intensified method on them.

1914 marks the début of the under-4-inch motor in both the four- and six-cylinder divisions. There are not fewer than thirty-six different models with motors under the 4-inch mark. Some years ago when England announced a 4-inch race the idea of such a motor ever being feasible in America was ridiculed, the excuses offered being bad roads, hills and more severe service on the American car than on the European product. Those days have passed, and not only is the 4-inch motor here, but the under-4-inch one is a reality. This is a step forward, not only because it means reduction in fuel, but because it means a cutting out of useless weight, so that with the smaller motor you have a car of flexibility equal to that in the heavier models, and also a car with speed ability equal to any rational demands. The watchword ahead should be a 3.5-inch motor on a 2500-pound car. With a six-cylinder design meeting these requirements, the manufacturer will have a type of car that will have a wide selling field and the buyer will have a machine adequate to all his needs so far as passenger accommodation, flexibility and speed are concerned.

As stated in these columns a year ago, the pendulum of motor size is swinging backwards, back from the big cylinder to the smaller long-stroke design. The average horsepower of the 1912 car was 45.77, for 1913 it measured 41.24 horsepower and for 1914 the figures have fallen still lower, to 38.2. 1915 will witness a still further backward swing to the still smaller motor, and to the motor with a slightly longer stroke.





Duray on 300-horsepower Fiat

Making 142 miles an hour

Front view of 300-horsepower Fiat

## Makes 142 m.p.h. in 300-h.p. Fiat

Arthur Duray Prevented, by Weather Conditions, from Breaking World's Flying Kilometer Record Held by Hemery

PARIS, DEC. 16—With a 300-horsepower Fiat, Arthur Duray has attained a speed of 142 miles an hour in an attempt to secure the world's flying kilometer record. Although the racing machine was officially timed to travel at this speed, the official record was not secured, for the European regulations call for the distance being covered in both directions, and the average being taken. This failure was due to weather conditions, and it is Duray's intention to make a further attempt early in April. He believes it is possible to show a speed of 150 miles an hour.

The attempt on this record was carried out on the shore road near Ostend. In one direction Duray had a run of 2,000 yards before striking the measured kilometer, and in the opposite direction about 1,600 yards. The best officially timed run in one direction was at the rate of 139.8 miles an hour. Another run in the same direction showed 142.9 miles an hour, but on this occasion the electric contact of the automatic timing instrument recorded a streak instead of a dot, and the rules made it impossible for Duray to have the benefit of the doubt. In order for the performance to be officially accepted the return run had to be made within a quarter of an hour of the first trip. It was never possible to get such weather conditions as would make this possible, the attempts always being interrupted by strong wind from the sea, by rain, or by sand blown over the road.

The present kilometer record is held by Victor Hemery, on a Benz, with which he covered the kilometer at Brooklands, on November 8, 1909, in 17.76 seconds, being equal to 125.9 miles an hour. This is the average for the two runs. Bob Burman's record, also on a Benz, when he covered the kilometer in 16.2-5, equal to 139.8 miles an hour, has never been recognized by the International Association of Recognized Automobile Clubs, for no proof has been given that it was the average in two directions and that the car was timed, with the Holden electric apparatus.

### Mechanical Details of the Car

Duray's record-braking Fiat is a chain-driven car having a huge monobloc four-cylinder motor of 7.48 by 10.4-inch bore and stroke. It follows the general Fiat racing motor design by having overhead camshaft and overhead valves, the whole being inclosed by an aluminum housing. The vertical shaft operating the camshaft is at the rear of the casting. Pump and magneto are driven by a cross-shaft, also at the rear, the magneto being at the right and the pump at the left. The water intake pipe is carried alongside the motor from the bottom of the radiator to the pump at the rear, then back again with the two connections through the screwed-on copper jackets forming two big panels on the side of the motor. There are two separate exhaust outlets, these being short lengths of pipe just sufficient to carry the exhaust gases outside the bonnet. Two independent carbureters are fitted, each one feeding a pair of cylinders.

For the record attempts the car was fitted with a long windcutter ahead of the radiator, the opening for air to enter the radiator being only 2 inches across. A long tail was also fitted. The car is chain driven, and during the trials ran with Rudge-Whitworth wire wheels and Continental tires. Owing to the long stroke of the motor and the overhead valve gear, the car has an unusually bulky appearance, the height from the ground to the top of the bonnet being 5 feet 7 inches. This is the actual height of the motor, for between this latter and the bonnet the clearance is the smallest possible. This is doubtless the biggest successful motor put into a chassis. In 1911 Nazzaro appeared on Brooklands track with a Fiat of 9.4 by 12.59-inch bore and stroke, but the car was too hard to handle.

PARIS, FRANCE, Dec. 19—Peugeot and Sunbeam have each entered three cars in the French Grand Prix, to be run at Lyons next July. The only other car entered at the present moment is an Alda.

### A. A. A. Assigns Racing Dates

NEW YORK CITY, Dec. 26—At a meeting of the contest board of the American Automobile Association, held at A. A. A. National Headquarters last week, requests for assignment of 1914 dates for motor car contests were considered and the following tentative dates were assigned contingent upon proper completion of the preliminary conditions prescribed by the contest rules:

Promoter	Event	Date
Indianapolis Motor Speedway.....	500-Mile Race.....	May 30
Sioux City Auto Club and Speedway Assn.....	300-Mile Race.....	July 4
Tacoma Carnival Assn.....	Road Races.....	July 3-4
Seattle Speedway.....	.....	July 13-14
Chicago Automobile Club.....	Elgin Road Races.....	Aug. 28-29
Corona Auto Assn.....	Road Race.....	Sept. 9
El Paso Auto Club.....	Phoenix Road Race.....	Nov. —

For the past 4 years all drivers of automobiles in contests have been required to register annually with the contest board. Registry cards have been issued drivers, which cards may be required to be exhibited to the referee or starter upon demand at any sanctioned event. Under the present rules, in all road races, and in beach, speedway or dirt track meets, 50 miles or more in length, or in practice therefor, the crew of a car must consist of both driver and mechanic, and for the first time the coming year all mechanics will be required to be registered with the contest board.

The fee for registration of drivers has been increased from \$2 to \$3, and in addition to the usual registry card drivers will be issued a lapel button embracing the wheel design of the A. A. A., and bearing the words "Registered Racing Driver," with the driver's registry number. The yearly registry fee for mechanics will be \$2, and they will be issued somewhat similar registry cards and lapel buttons.

# F. & S. Interest Wins Bearing Suit

**Court Holds That Bearings Made by Fichtel & Sachs in Germany and Sold in America by the J. S. Bretz Co. Do Not Infringe Conrad Patent Owned by German Concern of Which Hess-Bright Mfg. Co. Is American Licensee**

**If Patent Had Been Upheld It Would Have Meant a Practical Monopoly of the Ball Bearing Industry in the United States**

**N**EW YORK CITY, Dec. 30—A decision of the utmost importance to the automobile industry at large and the ball-bearing industry in particular has been handed down by Circuit Judge McPherson in the United States District Court of Philadelphia in the suit of the Hess-Bright Mfg. Co. of Philadelphia and the Deutsche Waffen und Munitions Fabriken of Germany against Hedwig Fichtel and Ernst Sachs of Germany, doing business as Fichtel & Sachs, and their exclusive American representative, the J. S. Bretz Co., of New York. The court decided in favor of the defendants, the decree dismissing the bill at the cost of the plaintiffs.

The suit, which was brought by the Hess-Bright interests, October 28, 1911, was for infringement of the Conrad patents, Nos. 822,723 and 838,303, covering, among other features, the continuous and uninterrupted race type of construction in a ball bearing. The patent is owned by the Deutsche Waffen und Munitions Fabriken of Germany, the Hess-Bright company being the exclusive licensee in America.

The importance of this suit may be realized when it is stated that if the Conrad patent had been upheld by the court in this suit the F. & S. interests would have probably been held responsible for and obliged to pay royalties on, all the ball bearings they have sold in the United States since 1905, and more important still, the decision would have given the Hess-Bright company a practical monopoly on ball bearing manufacture and sale in the United States.

The two claims of the Conrad patent involved in the suit are 8 and 9, as follows:

8—A bearing comprising two concentric rings, balls between said rings, each ring having a groove both sides of which overhang said balls and are continuous and practically integral throughout their circumference, the number of balls being such that they can be inserted in the space between the rings when the latter are displaced from their normal position, and means for distributing the balls throughout the length of the groove, whereby the two rings are held together against axial displacement by the engagement of the balls with the overhanging walls of the grooves and the parts are held together so as to form a unitary device.

9—A bearing comprising two concentric rings, balls, between said rings, each ring having a groove, both sides of which overhang said balls and are continuous and practically integral throughout their circumference, the edges of said sides being separated so far from each other that by displacing the rings eccentrically a limited number of balls may be inserted between them and distributing devices adapted to be introduced between said edges and into the spaces between said balls when the rings are restored to concentric position, whereby the two rings are held together against axial displacement by the engagement of the balls with the overhanging walls of the grooves and the parts are held together so as to form a unitary device.

## Same Court Upheld Patent Before

The same court which has just decided against the patent upheld it broadly March 10, 1910, the opinion being written by Judge Holland in a suit brought by the same complainants against the Standard Roller Bearing Co. of Philadelphia. The Standard company had to take out a license and pay royalties of 10 per cent. on the selling price for all bearings made under this patent, the payment of these royalties dating from June 6, 1910.

The F. & S. bearing, which is made by Fichtel & Sachs, with factories in Schweinfurt, Germany, and Lancaster, Pa., has notches at the side of the race, cut obliquely, to allow the introduction of balls between the rings. These are not cut to the bottom of the groove. The Hess-Bright construction based on the Conrad patent consists in displacing the rings eccentrically

for the introduction of the balls, no notch being used. Naturally, the F. & S. construction permits the introduction of more balls than is possible without the notch.

## Case Hung on 24/10,000 Inch

The essence of the Conrad patent is that the groove in the raceway should be continuous and uninterrupted, and if notches are cut into the side of the ring above the bottom of the groove the Hess-Bright people claim that the bottom of the groove is continuous and uninterrupted. If the notch is cut to the bottom of the groove the construction is held to be inefficient and hence is disregarded by the patent.

In arguing the case it was ascertained that the effective side of the groove, meaning that part of the groove coming in contact with the balls, covers only 44/10,000 of an inch, and the defendants claimed that this was an exceedingly minute dimension on which to base a patent.

Suit was brought against the Standard Roller Bearing Co. under this patent in Philadelphia, Feb. 15, 1909. The patent was upheld. Another suit was brought against the Adams Repair Co. of New York, Oct. 25, 1909. This suit was not defended and a decree by default was entered. Two other suits were brought, one against the Keller Mfg. Co., July 11, 1910, in Philadelphia and one against the Duntley Mfg. Co., in Philadelphia July 15, 1910. In both cases a preliminary injunction was granted. The suit against the Standard Roller Bearing Co. was the only one to come to a final hearing except the one just decided. This was brought Oct. 28, 1911, but, owing to the death of one of the experts on the subject, and other causes, was postponed till this fall.

Two old patents were referred to in arguing the suit, one, the Oldfield patent, covering a bearing made with a raceway filled with balls and having notches cut to the bottom of the groove, and the other, the Gentry patent, granted in England, having concentric grooved rings with no notches and a limited number of rollers.

## Many Makers Affected

Among the bearing makers who would have been affected by the decision if the patent had been upheld are Malliset & Blynn of France, B. K. F. of Germany, R. I. V. of Italy, Schafer, H. C. B. Ideal and Rhineland of Germany, S. R. O. of Switzerland and New Departure and U. S. of the United States.

The defence claimed that the patent must be limited to bearings with no notches in the rings, that each ring must be continuous and that bearings with notches at the side of the rings are not covered thereby. Also that ball separators are necessary in the type of construction described in the patent. The court agreed with this view.

In concluding his opinion, Judge McPherson said:

I think the defendants' supplemental brief summarizes accurately the material differences between the patent and the defendants' bearings:

There are three features which the Conrad patent has pointed out and emphasizes as characteristic of his alleged invention. They constitute the invention. They are:

1. Continuous, unnotched and unrecessed rings;
2. The limited number of balls (only as many balls as can be inserted by eccentrically displacing the rings, plus perhaps one), and
3. Distributing means, necessary to prevent the bearing from falling apart, and having that function.

The defendants' bearings lack each one of these characteristics, and, on the contrary, contain its exact opposite:

1. Notched, recessed rings;
2. A large number of balls (from one to several more than could be inserted by displacing the rings eccentrically), and



3. A ball-spacing device, which is not necessary for preventing the bearing from falling apart, and has no such function.

Without further discussion I state my opinion to be that the defendants do not infringe; and if this conclusion be correct, the plaintiffs must fail. The defense of laches, which would otherwise need consideration, will not be dealt with.

A decree may be entered dismissing the bill at the costs of the plaintiff.

The Hess-Bright interests state that an appeal will be made from the decision at once and prosecuted with the utmost vigor.

#### Motion Granted to Swinehart Tire & Rubber Co.

NEW YORK CITY, Dec. 29—A motion to vacate an attachment granted to J. Z. Lowe, Jr., W. A. De Long and J. S. Harriman in the State Court recently, against the Swinehart Tire & Rubber Co., has been granted by Judge Ward in the U. S. District Court of the Southern District of New York. Suit was brought late last November against the Swinehart company by these three men, who are the trustees in bankruptcy of the New York Commercial Co. The suit involved an alleged breach of contract on the part of the defendants and the Cuyahoga Rubber Co. The complainants are asking for \$22,362.67, with interest on \$11,410 and \$10,948.07.

It seems that the Swinehart company entered into an agreement with the plaintiff by which it guaranteed the performance of the Cuyahoga company of a contract which that company has repudiated and, therefore, the plaintiffs are suing for the price. The contract was on rubber to be delivered in the future to the Cuyahoga company, but which was not signed by it, but by the Swinehart company. After the rubber reached the plaintiff's warehouse, it is stated that the Cuyahoga company refused to accept the goods. The Swinehart company, it is alleged, then offered to buy the rubber for \$20,000. An attachment was granted to the plaintiff, but this has been vacated because it could not be proved whether this company had really placed such an order.

#### Valvoline vs. Havoline Dismissed with Costs

NEW YORK CITY, Dec. 29—A case which has been running in the U. S. District Court of the Southern District of New York, since February 9, 1912, has been dismissed with costs by Judge Mayer. The Valvoline Oil Co. brought suit against the Havoline Oil Co. and the Indian Refining Co. of New York for alleged infringement by the name of Havoline. The bill of complaint asked that the defendant be enjoined from using the word Havoline in gas engine and automobile lubricants.

#### Napier Wins Suit in English Court

LONDON, ENG., Dec. 20—Lord Chief Justice gave judgment in the action brought by S. F. Edge against D. Napier & Son, Ltd., and Mr. Napier.

A question of construction arising on the agreement between the parties came on for argument before His Lordship this morning, when he decided that the construction contended for by Mr. Edge could not be supported, and His Lordship accordingly gave judgment on all points in favor of the Napier Co. and Mr. Napier, with costs.

MADISON, WIS., Dec. 27—The French Battery & Carbon Co. of Madison, Wis., has won its contention before the Interstate Commerce Commission against the Lake Shore & Michigan Southern lines that freight rates on manganese ore shipped from Elyria, O., to Madison are unreasonable. The Madison company has been awarded a drawback of \$160.52 on one shipment of five carloads of ore, the freight charges on which amounted to \$759.62. The railway charged a joint rate, which it was proven was considerable higher than the sum of the intermediate rates between the two points.

#### Commercial Vehicles Defined

NEW YORK CITY, Dec. 29—There has been some doubt as to whether certain types of motor vehicles should be classified as commercial vehicles or not. For example, the taxicab may be used, either as a private town car or for hire as a public conveyance; so may the station wagon and the motor stage. Many persons do not rank motor fire apparatus as motor trucks or commercial vehicles because it does not carry merchandise. The funeral car is another vehicle that occupies an uncertain position. There are also special service machines, such as emergency wagons, tower wagons, and fire chiefs' cars that seem to constitute an intermediate class between the pleasure or passenger car and the commercial vehicle.

Owing to the decision of the manufacturers not to hold any national exhibition of motor trucks this winter and the consequent restriction of the annual shows in New York and Chicago solely to passenger cars, there was an apparent need for a definition that would make clear what types of vehicles are embraced in the term, commercial vehicle. Such a definition was considered at the last meeting of the commercial vehicle committee of the National Automobile Chamber of Commerce and recommended to the board of directors. It is as follows:

"A commercial motor vehicle is a self-propelled vehicle designed to be operated without rails for the primary purpose of transporting materials, products, passengers or apparatus especially for business purposes or for hire, profit, emergency work, or special utility service as distinguished from private personal use by the owner or renter for enjoyment or convenience."

It will be noted that this definition excludes all vehicles that are not designed by the manufacturers primarily for industrial or commercial purposes.

#### Temporary Licenses in Ohio

COLUMBUS, O., Dec. 29—The various automobile clubs in Ohio are arranging to issue temporary number plates to owners of new automobiles after December 31, 1913, when the present tags expire. Since the Warnes law was declared unconstitutional there are now no provisions for the registration of motor cars in Ohio, and this action has been taken in order to protect the public and give police departments some means of identifying motor cars.

#### City Bureau to Control Automobiles

NEW YORK CITY, Dec. 30—The first meeting of the recently organized Committee for the Prevention of Reckless Driving and Street Accidents was held in the rooms of the New York County Lawyers' Association, 165 Broadway, yesterday. A committee of fifteen was formed to urge legislation to govern chauffeurs on Governor Glynn and Mayor Mitchell. It was suggested that as a means of lessening accidents to pedestrians the traffic squad of the police department should be increased, the idea being that there are fewer accidents where the traffic men are stationed. One solution of the situation would be to establish a Central Bureau in this city, with full powers under the law to control the operation of automobiles.

NEW YORK CITY, Dec. 29—The Contest Board of the American Automobile Assn. has decided to recognize the cyclecar for competitive events. It is probable that many meetings will be scheduled in the vicinity of New York City.

#### \$164,232,365 for Roads in 1912

WASHINGTON, D. C., Dec. 26—Of more than ordinary interest to motorists throughout the country is a comparison between the expenditure on public roads in the United States in 1904 and in 1912, compiled by the office of public roads of the agricultural department.

In 1904 the total expenditure on all public roads in the United States was \$79,771,417, but in 1912 the expenditures for this purpose amounted to \$164,232,365. The expenditure per mile of public roads in this country for 1904 was \$37.07, but the expenditure per mile for the year 1912 had doubled, amounting to \$74.65. The expenditure per inhabitant in 1904 was \$1.05, but in 1912 it amounted to \$1.78.

The great progress in road building has been made in the states which contribute from the state treasuries toward the construction of state-aid or trunk-line roads. In 1904 there were 13 states that contributed out of the general fund \$2,607,000, but in 1912 there were 35 states, which contributed \$43,757,438. The states having the largest expenditures for state-aid and trunk-line roads in 1912 were as follows: New York, \$23,000,000; Pennsylvania, \$4,000,000; Maryland, \$3,370,000; Connecticut, \$3,000,000.

#### New Orleans Exports Increase

NEW ORLEANS, LA., Dec. 26—Exports from New Orleans showed a decided increase during October. A total of 312 cars were shipped to European and Latin American ports. The larger number went to Latin America. Among the Latin American countries, Argentina received the greatest number of cars. The rapid increase in the use of smooth surfaced street paving in Latin American cities and the building of better country roads are responsible for the greater use of automobiles in this section of the world, although the trade is hampered by very high prices of gasoline.

## Dealers Take Over 2 Peerless Branches

### Peerless Buildings Representing Investment of Millions Also Fall Under Their Control

NEW YORK CITY, Dec. 29—The C. T. Silver Motor Co. will after January 1 handle the Peerless car in this and adjacent territory. The Peerless building, representing an investment of \$1,800,000, will fall under the control of Mr. Silver. In order to reduce the overhead expense incident to using a large building exclusively for the sale of one car, an arrangement has been made whereby the McDuffee Automobile Co., in Chicago, Ill., and the above company take over the entire business and equipment in those cities.

"It is our aim in taking this step to readjust the proportion between selling and manufacturing expense in Peerless cars," said E. J. Kulas, general manager of sales of that company.

In Chicago J. R. Buck, general manager of the Peerless company, will join the McDuffee organization with all the men who have been most successful in developing the Peerless Chicago business, and in New York the corresponding members of the branch staff will be taken into the C. T. Silver Co.

### Stearns Co. Declares Another Dividend

CLEVELAND, O., Dec. 27—The F. B. Stearns Co., maker of Knight-Stearns motor cars, declared a cash dividend of 10 per cent. on the capital stock on December 23, in addition to the 8 per cent. cash dividend paid on July 1, 1913. The action was taken at an adjourned meeting of the directors. The company has no preferred stock and there are no bonds or mortgages. The officers were all re-elected, as follows: president, Frank B. Stearns; vice-president, Roy F. York; secretary and treasurer, E. McEwen.

### Rauch & Lang Dividend Declared

CLEVELAND, O., Dec. 27—Directors of the Rauch & Lang Carriage Co. have declared the usual quarterly dividend of 1 3/4 per cent. on the preferred stock and 2 per cent. on the common stock, payable January 1. The company has no outstanding bonded indebtedness or mortgage, and it is officially stated that the company will end the year without liabilities of any kind other than the bills covering December purchases.

### Peerless Declares Dividend—Optimistic Outlook

CLEVELAND, O., Dec. 30—Directors of the Peerless Motor Car Co., declared the regular quarterly dividend of 1 3/4 per cent. upon the preferred stock of the company at a recent meeting. The review of the year's business proved to be highly satisfactory. The outlook for the coming year was regarded as particularly bright. A considerable increase in the production of heavy duty trucks for commercial purposes is looked for. Indications also point to a rapidly increasing volume of sales in the fire apparatus which the company is building, and in other trucks especially constructed for municipal service.

### Will Make Howard and Lexington Cars.

INDIANAPOLIS, IND., Dec. 29—The Indiana secretary of state in this city has issued a charter for the Lexington-Howard Co., Connersville, Ind., which has been incorporated with an authorized capitalization of \$150,000. Directors of the new company, which takes over the manufacturing end of the Howard Six and Lexington cars, are E. W. Ansted, J. E. Huston and F. I. Barrows. The result is a strong company, that is preparing to manufacture cars on a large scale during the coming season.

### Ford Adds \$1,000,000 Power Equipment

DETROIT, MICH., Dec. 29—The Ford Motor Car Co. has let contracts for a big addition to its power equipment, which will increase the 15,000 horsepower now developed by the big gas engines by 28,000 horsepower. The new engines will be a realization of one of Henry Ford's fondest dreams, for all the energy developed by the combustion of the fuel gas will be converted into useful power. The new engines are an en-

tirely new design and will have one cylinder of the heavy-duty, gas type, and another cylinder using steam. The steam for the second cylinder is to be generated by the waste heat from the gas cylinder. These engines will be built by the Hooven, Owens, Rentschler Co., of Hamilton, O., and will cost about \$600,000. The generator contract calls for four machines of 3,750 kilowatts output for each, and will cost about \$250,000. They will be made by the Cadwell-Wheeler Co. for the W. J. Hartwig Co., of Detroit.

The present gas engines, which stand behind great plate-glass windows facing Woodward Ave., are among the largest in the world, but they fail to furnish all the power required by the Ford factory. It is said that the outside power bill for this year will be between \$250,000 and \$300,000. The requirements for power will be even greater after July 1, 1914, when the contract with Dodge Bros. expires and the parts now made by them will be built in the Ford factory. The total cost of the new engines and dynamos, together with the additions to the power building for housing them, will approximate \$1,000,000.

### Gaulois Reduces Tire Prices

NEW YORK CITY, Dec. 29—The Gaulois Tire Corp., 49 West Sixty-fourth street, has reduced its tire prices, ranging from 10 to 12 per cent. on the present prices; for example the 34 by 4 plain-tread tires are now \$30.85, the former price being \$35.05, while the 37 by 5 non-skid are now \$66.50, the old price being \$64.40.

### Companies Adding Men to Payroll

AKRON, O., Dec. 29—The Goodyear Tire and Rubber Co. will add 2,500 men to its payroll on January 1, bringing its force up to 8,000.

RACINE, WIS., Dec. 29—The International Harvester Co. will take on 2,000 men, while the Case Threshing Machine Co. and other Racine industrial concerns will add 4,000 men to their payrolls.

### Automobile Securities Quotations

No changes of any importance occurred in this week's automobile quotations. At the close of the year there are about nine automobile securities selling at par or over.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com.	180	200	195	210
Ajax-Grieb Rubber Co., pfd.	96	100	98	101
Aluminum Castings, pfd.	97	100	97	100
Chalmers Motor Company, com.	..	..	90	91
Chalmers Motor Company, pfd.	..	..	90	93
Consolidated Rubber Tire Co., com.	13	14	39	40
Consolidated Rubber Tire Co., pfd.	50	60	106½	107½
Firestone Tire & Rubber Co., com.	310	320	242	250
Firestone Tire & Rubber Co., pfd.	105	107	103	104
Garford Company, preferred.	105	102	80	90
General Motors Company, com.	32	34	36½	38
General Motors Company, pfd.	76	78	76	78
B. F. Goodrich, com.	64	65	22½	23½
B. F. Goodrich Company, pfd.	103	105	78	79
Goodyear Tire & Rubber Co., com.	440	450	190	195
Goodyear Tire & Rubber Co., pfd.	104	105	92	94
Gray & Davis Co., preferred.	..	..	94	101
Hayes Manufacturing Company	..	90	..	..
International Motor Co., com.	10	20	..	5
International Motor Co., pfd.	40	60	..	14
Kelly-Springfield Motor Truck Co., com.	..	..	40	60
Kelly-Springfield Motor Truck Co., pfd.	..	..	90	105
Lozier Motor Company, com.	..	..	..	15½
Lozier Motor Company, pfd.	..	..	..	90
Maxwell Motor Co., common.	..	..	3	3½
Maxwell Motor Co., 1st pfd.	..	..	21½	22
Maxwell Motor Co., 2nd pfd.	..	..	7	7½
Miller Rubber Company	160	170	115	120
New Departure Mfg. Co., com.	..	..	135	145
New Departure Mfg. Co., pfd.	..	..	101	102
Packard Motor Company, pfd.	104	106	91	95
Palmer & Singer, pfd.	..	..	65	..
Peerless Motor Company, com.	..	..	15	25
Peerless Motor Company, pfd.	..	..	75	80
Pope Manufacturing Company, com.	35	36	1	2
Pope Manufacturing Company, pfd.	79½	80½	7	12
Portage Rubber Co., com.	..	..	..	40
Portage Rubber Co., pfd.	..	..	..	90
Reo Motor Truck Company	9	10	6½	..
Reo Motor Car Company	20	21	14½	..
Rubber Goods Mfg. Co., pfd.	105	108	104	112
Russell Motor Car Co., com.	..	..	..	40
Russell Motor Car Co., pfd.	..	..	..	70
Splittorf Electric Co., pfd.	..	..	40	45
Stewart-Warner Speedometer Co., com.	..	..	47	51
Stewart-Warner Speedometer Co., pfd.	..	..	94	97
Studebaker Company, com.	33½	35	18	18½
Studebaker Company, pfd.	92	94	68½	70
Swinehart Tire Company	100	105	68	71
U. S. Rubber Co., common.	..	..	56	57
U. S. Rubber Co., 1st pfd.	..	..	100½	101
Vacuum Oil Co.	..	..	195	198
White Company, preferred.	104	107	105	110
Willys-Overland Co., com.	70½	71	59	62
Willys-Overland Co., pfd.	98½	99½	80	85



# Hartford Rubber Co. Doubles Capital

**Increase from \$1,000,000 to \$2,-  
000,000—Half of the Stock Is  
Preferred and Will Pay 6 Per Cent.**

HARTFORD, CONN., Dec. 29—There has been filed in the office of the secretary of state by the Hartford Rubber Works Co. a certificate on increase of capital stock from \$1,000,000 to \$2,000,000. The number of shares has been increased from 10,000 to 10,000 preferred and 10,000 common stock, each share of par value of \$100. The holders of the preferred stock will be entitled to a dividend of 6 per cent., payable annually or quarterly, which shall be cumulative and payable before any dividend shall be set apart or paid on the common stock. Such preferred stock shall have full voting power. The treasurer is authorized to dispose of the preferred stock at not less than par. The certificate is signed by Charles A. Huntington, Ernest Hopkinson, Elisha Williams and J. D. Anderson, a majority of the directors. Mr. Anderson is president of the corporation and Mr. Hunter vice-president.

## Singer to Head Palmer-Singer

LONG ISLAND CITY, N. Y., Dec. 31—At a special meeting of the board of directors of the Palmer & Singer Mfg. Co. today C. D. Knapp retired from the presidency and Chas. A. Singer, Sr., was elected to his place. The other officers of the company will remain the same.

## Page to Manage New Departure

BRISTOL, CONN., Dec. 29—On January 1, DeWitt Page, secretary of the New Departure Mfg. Co., of Bristol, will become general manager and will also continue the office as secretary. Charles T. Treadway, treasurer, will become chairman of the board of directors. The position of general manager has been held up to the present by Albert F. Rockwell, president of the company, as was also the recently created berth of chairman of the board of directors. Mr. Rockwell is to continue as president of the company. The company recently increased the capital stock from \$1,500,000 to \$2,000,000. Mr. Rockwell did not confirm reports of retirement of other officials of the company.

## Buick Files Financial Statement

NEW YORK CITY, Dec. 26—The Buick Motor Co., incorporated under the laws of Michigan, has filed a statement of its financial condition, dated December 9, 1913, which is compared as follows:

Assets:	1913	1912
Real estate branches.....	\$72,284	.....
Machinery branches.....	51,669	.....
Material, stock in process.....	5,638,927	\$4,283,600
Furniture.....	61,984	.....
Cash and debts receivable.....	4,453,951	2,767,706
Investments.....	516,400	3,041,084
Other assets.....	4,270,321	1,014,213
<b>Total.....</b>	<b>\$15,065,536</b>	<b>\$11,106,604</b>
<b>Liabilities:</b>		
Capital stock.....	2,500,000	2,500,000
Accounts payable.....	2,189,094	670,838
Floating debt.....	2,013,099	1,432,076
Surplus.....	8,363,343	6,503,690
<b>Total.....</b>	<b>\$15,065,536</b>	<b>\$11,106,604</b>

## Willys-Overland Ships Three Trainloads

TOLEDO, O., Dec. 23—Another demonstration of the stability of the motor car industry, in spite of the rumors and gossip of the pessimists to the contrary, is given in a recent order filled by the Willys-Overland Co. This concern last week shipped a special train containing thirty carloads of cars to the Overland-Marion Sales Co., its Philadelphia distributor. Ninety cars were included in the shipment, which was a special order, in excess of the allotment of the Philadelphia concern.

## New Company to Make Gadabout

NEW YORK CITY, Dec. 30—The Gadabout Motor Corp. has been organized, with temporary offices at 29 Broadway, to manufacture

the Gadabout, a light car weighing 550 pounds, equipped with a four-cylinder, 12-horsepower motor, two-speed gearset and two-passenger body, and selling for \$400 f.o.b. factory. The car has a wheelbase of 84 inches and a tread of 46 with a clearance of 9 inches. The officers of the company, which is capitalized at \$250,000, are: Robert A. Lau, president; Charles Vail, vice-president and general manager; Edwin M. Simpson, secretary; Philip Haseltine, treasurer; J. Dean Grandin, second vice-president and sales manager of New York; A. Vernon Clarke, third vice-president and director; John A. Bush and F. H. Massecar, directors, and W. A. Gruenberg, designing and consulting engineer.

## New Michigan Cyclecar Co.

FENTON, MICH., Dec. 26—A company has been formed for the manufacture of a cyclecar for two passengers and it is planned to build a factory. Secretary W. H. King has been assured of substantial aid by the council and it is possible the factory may be established here. O. J. Howick, formerly with the Lozier and Packard companies of Detroit, is the designer and builder. A car already is being used for demonstrations. The new car has a twin-cylinder, four-cycle, air-cooled motor and the capacity is 13 horsepower. It has electric lights. It is claimed that the narrow tread gives it an especial advantage.

## New Toronto Cyclecar Co.

TORONTO, ONT., Dec. 27—The Dart Cyclecar Co., Ltd., has been incorporated with a capital stock of \$100,000 by H. B. Smith, F. M. Lorsch and others, to manufacture cyclecars and power-driven vehicles.

## Cyclecar Firm in Portland

PORTLAND, ORE., Dec. 26—The Portland Cyclecar Co. will manufacture the new Portland cyclecar. A close corporation has been formed with L. I. Thompson as president, and C. J. McPherson as vice-president.

## Chamber of Commerce to Change Name

NEW YORK CITY, Dec. 30—The Automobile Chamber of Commerce will change its name to the National Automobile Chamber of Commerce, to become effective January 26.

## Market Changes of the Week

The usual changes in the market quotations occurred this week. Tin had a gain of \$0.73 per 100 pounds. Lead also experienced a gain, closing at \$4.15 or \$0.15 over the opening price. Lard oil rose \$0.01. Cottonseed oil dropped \$0.03. Both coppers rose, electrolytic, \$0.00 1-2 and the Lake, \$0.00 3-8 per pound. The situation in the world's leading crude rubber markets underwent no change of importance last week. The fortnightly auction of plantation rubber did not take place in London. The tone was steadier in the local market, despite the absence of any demand of consequence. Fine Up-river Para was calling at 73. The automobile scrap rubber situation has underwent no change.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.....	.66	.66	.66	.66	.66	.66	.....
Beams & Channels, 100 lbs.....	1.31½	1.31½	1.31½	1.31½	1.31½	1.31½	.....
Bessemer Steel, ton.....	20.00	20.00	20.00	20.00	20.00	20.00	.....
Copper, Elec., lb.....	.14½	.14½	.14½	.14½	.14½	.14½	+ .00½
Copper, Lake, lb.....	.14½	.14½	.14½	.14½	.14½	.14½	+ .00½
Cottonseed Oil, bbl.....	6.69	6.68	6.77	6.60	6.60	6.66	— .03
Cyanide Potash, lb.....	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown... ..	.39	.39	.39	.39	.39	.39	.....
Gasoline, Auto, 200 gals.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime... ..	.92	.93	.93	.93	.93	.93	+ .01
Lead, 100 lbs... ..	4.10	4.10	4.00	4.10	4.10	4.15	+ .15
Linseed Oil.....	.52	.52	.52	.52	.52	.52	.....
Open-hearth Steel, ton.....	20.00	20.00	20.00	20.00	20.00	20.00	.....
Petroleum, bbl., Kansas, crude... ..	1.03	1.03	1.03	1.03	1.03	1.03	.....
Petroleum, bbl., Pa., crude.....	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined.....	.62	.62	.62	.62	.62	.62	.....
Rubber, Fine Up-river, Para... ..	.73	.73	.73	.73	.73	.73	.....
Silk, raw Italy.....	4.95	.....	.....	4.95	5.10	.....	+ .15
Silk, raw Japan... ..	3.95	.....	.....	3.95	4.05	.....	+ .10
Sulphuric Acid, 60 Baume.....	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.....	36.65	36.88	37.10	37.13	36.88	37.38	+ .73
Tire Scrap.....	.05	.05	.05	.05	.05	.05	.....

## Moline's Power Increasing

### Readings on Knight Motor on Test Rise and Fall with Barometer

NEW YORK CITY, Dec. 31—At the end of the 281st hour at 12 noon today the Moline-Knight motor on test at the A. C. A. was running steadily at 1,115 revolutions per minute and developing 32 horsepower.

NEW YORK CITY, Dec. 30—At 7 o'clock this evening the Moline-Knight motor undergoing its official 336-hour test in the laboratories of the Automobile Club of America had completed 264 hours, 11 of the 14 days of the test having been ended. Up to this hour the motor has shown an average horsepower of 38.174, as given out on the unofficial bulletins of the club, this average being based on horsepower readings taken every 15 minutes. This shows an increase of approximately 1 horsepower since the test was started. The first reading of the test was 37.4 horsepower. Only once since the test started has there been a reading as low as 37 horsepower, which was at the 240th hour, when a heavier grade of fuel was added which was followed by a few minutes of lower crankshaft speed.

The power has been running very steadily since the start and has only varied with the barometer, the readings of which are shown in the table herewith, and which show a slight drop in power as the barometer dropped and a rise with the barometric rise. The highest horsepower reading was 40.8 at the 204th hour. The power variation due to barometric changes covers a range of about 2 horsepower.

Since the test started the horsepower has been taken every 15 minutes and has been averaged over 5-hour periods, the accompanying table showing the average for the twenty-six 5-hour periods since the start of the test. In only one period has the average dropped below 38 horsepower, and that around the 100th hour.

From a work point of view the motor is performing equivalent to carrying the car with load at 30 miles per hour on an 8 per cent. grade. For 264 hours this shows at this speed a total performance of 7,920 miles. The consistency which the motor showed in the early hours of the test is more apparent as the test continues, and not at a single time since the start has the horsepower fallen below the average for the first reading of the test. The test is made at a crankshaft speed of 1,100 r.p.m.

VERAGE HORSEPOWER READINGS FOR 5-HOUR PERIODS  
OF MOLINE-KNIGHT TEST WITH BAROMETER READINGS

Date	Horse-power	Barom-eter	Date	Horse-power	Barom-eter
Dec. 19—			Dec. 25—		
7:12 P.M. ....	38.2	29.97	12:05 A.M. ....	38.7	
Dec. 20—			5:10 A.M. ....	38.7	29.82
12:05 A.M. ....	38.2		10:03 P.M. ....	38.4	
5:10 A.M. ....	38.2	29.91	3:08 P.M. ....	38	29.67
10:03 P.M. ....	38.1		Dec. 26—		
3:08 P.M. ....	38.1	29.78	8:01 A.M. ....	37.7	
Dec. 21—			1:06 A.M. ....	37.4	29.16
8:01 A.M. ....	38.2		6:11 A.M. ....	37.5	
1:06 A.M. ....	38.2	29.72	11:04 P.M. ....	37.5	29.05
6:11 A.M. ....	38.1		4:09 P.M. ....	37.7	
11:04 P.M. ....	38.1	29.88	Dec. 27—		
4:09 P.M. ....	38.1		9:02 A.M. ....	38	29.53
Dec. 22—			2:07 A.M. ....	38.4	
9:02 A.M. ....	38	29.77	7:12 A.M. ....	38.6	29.89
2:07 A.M. ....	38.1		12:05 P.M. ....	39	
7:12 A.M. ....	38.2	29.91	5:10 P.M. ....	39.6	30.07
12:05 P.M. ....	38.3		Dec. 28—		
5:10 P.M. ....	38.4	30.10	10:03 A.M. ....	39.8	
Dec. 23—			3:08 A.M. ....	40.1	30.15
10:03 A.M. ....	38.8		8:01 P.M. ....	39.5	
3:08 A.M. ....	38.7	31.15	1:06 P.M. ....	39.5	29.99
8:01 P.M. ....	38.4		6:11 P.M. ....	38.7	
1:06 P.M. ....	38	30.06	Dec. 29—		
6:11 P.M. ....	37.8		11:04 A.M. ....	38.8	30.08
Dec. 24—			4:09 A.M. ....	38.5	
11:04 A.M. ....	38	29.66	9:02 P.M. ....	38.4	30.06
4:09 A.M. ....	38.2		2:07 P.M. ....	38	
9:02 P.M. ....	38.3	29.75	7:12 P.M. ....	37.8	29.86
2:07 P.M. ....	38.4		Dec. 30—		
7:12 P.M. ....	38.4	29.81	12:05 A.M. ....	37.9	
			Average ....	38.174	29.87

### Bollee, French Pioneer Maker, Dies

PARIS, Dec. 20.—Leon Bollee, pioneer automobile manufacturer and head of the Leon Bollee Automobile Co., Le Mans, has died of an affection of the heart at the age of 43. Leon Bollee was the younger son of Amedee Bollee, one of the earliest automobile manufacturers in France, and a man who played a rôle in his own country equal to that of Daimler in Germany. In 1878 Bollee produced a remarkable car known as La Mancelle,

having among its characteristics a vertical motor in front, clutch, shaft, gearbox and differential and final drive by side chains with the use of radius rods. At 20 years of age Leon Bollee produced his own car and with it covered 100 kilometers (62 miles) in 118 minutes.

### Makers To Sell Cleveland Truck

DETROIT, MICH., Dec. 26—The Cleveland truck made by the Lewis Spring & Axle Co., Jackson, Mich., which heretofore has been marketed only through C. D. Paxon, general sales agent at Cleveland, O., is now being offered by the maker direct as well.

This truck, which sells for \$1,250, is practically all made in the Axle company's factory, and makes use of a four-cylinder engine of 4.5 by 4.5 inches bore and stroke. This motor has an overhead camshaft with the valves contained in cages and inclined at 45 degrees in the cylinder heads. Disk clutch and three-speed gearset are in unit with the engine.

### Minneapolis—Yellowstone Tour Planned

MINNEAPOLIS, MINN., Dec. 29—Plans are under way for an automobile tour in 1914 over the Twin Cities-Aberdeen-Yellowstone trail from Minneapolis to the park, similar to the A. A. A. tour last summer from Minneapolis to Glacier Park, Mont. Under what auspices the tour is to be made has not been determined, but the scheme is being promoted by Dr. H. F. Marston, chairman of the committee of the Automobile club on entrants for the last national tour. The association to promote the trail recently met in Minneapolis to plan for further extension of the sign posting and grading work westward. It is expected that the Chicago, Milwaukee & St. Paul road may be interested in running a hotel train as the Great Northern did for the Minnesota state tour to Helena in 1911 and the 1913 run of the A. A. A.

### Cyclecar Run Starts for New York

CHICAGO, ILL., Dec. 30—Special Telegram—The cyclecar run from Chicago to New York started at noon today, when the Imp, driven by William B. Stout, of *Motor Age*, left for Toledo, O., where it will be joined by the second car from Chicago as well as by the Rocket and Mercury of Detroit. All will then go through to New York together. Road conditions are reported very bad as far as Buffalo but the narrow tread cars expect to get over the places which force the big cars to make detours.

### Beaver Bullet for 500-Mile Race

INDIANAPOLIS, IND., Dec. 29—An entry of a Beaver Bullet, by the Beaver Automobile Company, Beaver Falls, Pa., for the 500-mile race to be held at the Indianapolis Motor Speedway, May 30, has been received by the speedway management. This is the fifth entry to be received, the other being an Anel, two Stutzes and a Gray Fox.

It is understood that the Beaver Bullet will have a piston displacement just within the maximum, and that the company expects to emulate the example of the Stutz, which sprang into prominence in a day. A report has been received that Harry Grant will enter two Sunbeams in the event.

### 500 Cars Sold at Toledo

TOLEDO, O., Dec. 20—Toledo's sixth annual show was a great success. It was held in the new factories building under the auspices of the Toledo Auto Show Co., and will undoubtedly declare a greater dividend than ever before. Several hundred automobiles, motorcycles and automobile accessories were displayed. Approximately 50,000 people attended the show. A new record for the number of cars sold was established this year. Fully 500 cars have been sold. Dealers were surprised by the large number of automobiles purchased by farmers.

### Bowser Co. Closes Big Business Year

SOUTH BEND, IND., Dec. 29.—About \$5,000 was distributed at the factory of S. F. Bowser & Co., Fort Wayne, Ind., in the form of Christmas presents. Each head of a department received \$5, and the assistant foreman \$3, and each of the other employees \$2. This is the inventory season for the big oil tank plant and orders have been issued to suspend operations in some of the departments until January 5. Some of the departments, however, will be unable to suspend operations on account of the work that must be completed before the close of the year. The company is just closing one of the best year's business in its history and anticipates a still better showing in 1914.



## J-M Adds 3 Accessories

### Johns-Manville Acquires Carter Carbureter, Spark-No Lock and G-P Cut-Out

NEW YORK CITY, Dec. 30—The H. W. Johns-Manville Co. has taken over three more accessories. These are the Carter Carbureter Co., the Spark-No automobile lock and the G-P muffler and cut-out.

The Carter carbureter is of the single-jet type. One feature of it is the construction of the jet tube. It is a long tube rising above the gasoline level and having in its walls, spirally arranged, a series of very minute openings. The suction of the motor causes the fuel to rise in the tube more or less, according to the degree of pressure. The higher the liquid rises the more holes it can flow through and the more air it will impregnate with vapor. The spiral arrangement of the holes insures direct contact with the air. The carbureters are made in five sizes, from 1 inch to 2, and the prices range from \$20 to \$45.

In spite of its name, the Spark-No lock is not literally a lock but an ingenious piece of mechanism for rendering inoperative the battery and magneto ignition systems, by breaking the electric circuit. When the would-be thief throws on the ignition switch, instead of getting a spark in the motor he unconsciously causes a loud electric alarm bell to ring, announcing that some unauthorized person is meddling with the car. As both bell and wiring are concealed inside the body of the car he cannot stop the racket. The bell continues to ring until the owner or operator arrives and cuts it off. The lock is similar in appearance to a clock, while its mechanical operation bears a general resemblance to a combination lock. There is no key to be mislaid or lost. To start a car equipped with this device the operator moves the hands in a given sequence to a number of predetermined points by means of two knobs. There are two sets of combinations, one for battery and one for magneto ignition. When the proper combinations have been effected the electric circuit is automatically completed, and the car can be started in the usual way. As the Spark-No lock does not actually lock the mechanism, a car can be quickly moved to the street in case of fire in the garage, a very important feature in an emergency.

Still another product has been added to the H. W. Johns-Manville Co.'s growing list of accessories, in the form of the G-P muffler cut-out. This cut-out is manufactured by the G. Piel Co., Long Island City. The construction of the valve-tongue and its seat is such that, when the cut-out is open, the line to the muffler is completely shut off, and a correct angle is obtained for deflecting the exhaust gases freely and without a possibility of a back pressure being created on the motor. The cut-out is made in two parts, thus enabling quick and thorough access to its interior. When the cut-out is closed the pressure of the exhaust gases cannot open it. The course which the exhaust gases must take tends to prevent carbon accumulation on the valve or its seat. The area of the sections in every part of the cut-out is greater than any section of the exhaust pipe line. It is attached without flanges. The ends are bored to the exact size of the exhaust pipe, with shoulders at each end, and also a set screw which insures rigidity. Made in all sizes to fit 1-4-inch to 3 1-4-inch pipe.

### To Build Motor Traction Plows

DETROIT, MICH., Dec. 30—*Special Telegram*—A \$100,000 corporation made up of leading Detroit capitalists has started building traction plows under the name of the Steel King Motor Co. The incorporators are: Edwin S. George, Packard distributor, and Standford W. Crapo. The stockholders include the following prominent Detroit business men: Jerome Remi, K. E. D. Star, W. T. Barbour, A. A. Shantz, J. F. Nagel and others.

### To Handle Saxon in New Jersey

NEWARK, N. J., Dec. 29—Arrangements were made last week by the Paddock-Zusi M. C. Co., of this city, to handle the Saxon car for northern New Jersey.

### Will Furnish Michigan Spare Parts

DETROIT, MICH., Dec. 29—The Puritan Machine Co., of Detroit, has opened a department for furnishing repair parts for the Michigan car which was made by the Michigan Motor Car Co. before its failure. E. D. Edwards, formerly purchasing

agent of the Michigan company at Kalamazoo, has been placed in charge of the new department.

It is said that the Cass Motor Truck Co., of Port Huron, Mich., is making plans for a reorganization, and that A. W. Frantz, general manager, has written all the stockholders pointing out the advantages of such a move.

NEW YORK CITY, Dec. 30—A. R. Mosler & Co. has granted two new licenses under the Canfield patent. These are the Bosch Magneto Co., New York City, and the Auburn Ignition Mfg. Co., Auburn, N. Y.

BOSTON, MASS., Dec. 26—The entire \$500,000 Hood Rubber Co. preferred stock issue authorized by directors has been sold without any commission or underwriting, netting the company par.

### To Sell Disco Property January 14

DETROIT, MICH., Dec. 30—*Special Telegram*—At the creditors' meeting of the Disco Co., held December 29, the Security Trust Co. of Detroit was appointed trustee in bankruptcy and will sell the remaining property at public sale January 14 at 10 o'clock. They also have the privilege of selling all goods at private sale for 75 per cent. of its appraised value. The Ross & Young Machine Co., of Detroit, has purchased considerable of the stock of material in order to continue to equip with this type of starter the Paige motors which they build. Mr. Ross is not prepared at present to state whether his company will manufacture these starters for purposes other than to complete the Paige contract or not.

### Colonel Pope Sole Receiver

HARTFORD, CONN., Dec. 27—That Colonel George Pope, treasurer of the Pope Mfg. Co., will continue as the sole receiver in the Connecticut jurisdiction now seems to be conclusively settled. To-day Judge William S. Case, of the superior court, before whom Massachusetts interests representatives have appeared and applied for the appointment of Charles A. Morse, of Boston, as co-receiver in this jurisdiction, denied the last motion for appointment of Mr. Morse. There are now about 600 men at work in the Pope factory. The company will show at New York and Chicago. Present work is on a four-cylinder new model.

### Lansden Creditors' Meeting Postponed

NEWARK, N. J., Dec. 24—Henry L. Davison, trustee in bankruptcy of The Lansden Co., of this city, has notified all creditors that the meeting which was to have been held January 7 has been postponed until January 1, owing to the difficulty of having a complete inventory and appraisal of the property completed. Sealed bids for all or any part of the property have been solicited and this will be considered by the creditors at the meeting on January 21. The appraisers have valued the property, plant and equipment at \$125,742.70, this including \$10,000 for patterns, blue prints and drawings.

### Mora Power Wagon Receiver Named

CLEVELAND, O., Dec. 27—Federal Judge W. L. Day has named Frank H. Adams receiver for the Mora Power Wagon Co., 5320 St. Clair avenue. The Swinehart Tire & Rubber Co., of Akron, asked for the receiver in an involuntary petition filed with the district court.

SPRINGFIELD, MASS., Dec. 27—A meeting of the creditors of the Federal Chain & Mfg. Co. will be held on January 2 at 2:30 p. m.

NEW YORK CITY, Dec. 26—The Motor and Gear Improvement Co., 250 West Fifty-fourth street, will apply to the Supreme Court of the State of New York, at a Special Term, Part I, on January 2, for an order authorizing it to change its name to the Fischer Motor Corp.

DETROIT, MICH., Dec. 29—According to the records of Secretary of State Martindale, more Michigan farmers owned automobiles in 1913 than ever before. Owners in the cities registered 34,268 machines, and 19,060 licenses were issued to those living in townships and villages.

INDIANAPOLIS, IND., Dec. 27—On January 10 the property of the Indiana Motor and Mfg. Co., at Greenwood, Ind., is to be sold at auction to satisfy a judgment rendered some time ago in the sum of \$30,132 in favor of E. A. McAlpin, trustee.

# Factory Miscellany

**M**ILLION Dollar Factory Opened—The new million dollar factory of the Dominion Tire Co., Ltd., at Berlin, Ont., was opened recently. The new factory is constructed of reinforced concrete and is one of the largest buildings of its class in Canada. It is 432 feet long by 90 feet wide, with four stories and a basement. The columns and footings are designed to carry an additional story to be added at some future date, and extensions at either end of the building are also provided for. More than 800 tons of reinforcing steel were used in its construction, and approximately 40,000 square feet of steel sash for the windows. The board of directors of the Dominion Tire Co. is as follows: Mr. D. Lorne McGibbon, Colonel S. P. Colt and Messrs. Victor E. Mitchell, Elisha S. Williams, A. J. Kimmel, Homer E. Sawyer and T. H. Reider.

**Corbin Screw's New Addition**—The Corbin Brown Speedometer Co., New Britain, Conn., has completed a new 100 by 120-foot six-story brick addition to its plant.

**Gramm May Build in Tacoma**—The Gramm-Bernstein Motor Truck Co., Lima, O., it is reported, will build a factory in Tacoma, Wash., and that work of construction will begin within six months.

**National Tire's New Plant**—Work has been commenced on a two-story reinforced concrete and steel factory to be constructed for the National Tire & Rubber Co., East Palestine, O., at a cost of \$25,000.

**Monroe Body Acquires Plant**—The Monroe Body Co., Pontiac, Mich., manufacturer of automobile bodies, has acquired an additional factory building. The addition will be devoted largely to assembling purposes.

**Contemplates Purchasing Plant**—The Standard Sales Co., 915 Hippodrome Building, Cleveland, O., expects to begin work in the spring upon its own plant for the manufacture of its patented inner tire and also for casings and tubes. Meanwhile the sale of stock continues and officers of the company have several

sites for a factory under option. Arthur G. Elliott is the inventor and patentee of the Standard inner tire.

**Gibson Purchases New Plant**—The Gibson M. C. Co. has purchased the plant of the Pittsburgh Tube & Steel Co., Pittsburgh, Pa., and is remodeling it for the manufacture of automobiles. The main building is 150 by 200 feet. The equipment includes a gas-driven power plant of 5 horsepower. Machine tools and other equipment will be required.

**Ford's St. John Plant**—The Ford Motor Co., Ltd., Ford, Ont., has established a new branch at St. Johns, N. B. The new branch is to be managed by W. C. Warburton, formerly assistant manager of the Toronto, Ont., branch. The buildings to be ultimately an assembling point are those of the Maritime Motor Co., St. John, which the Ford company has leased for a term of years. For the present the plant will be used as warehouses and distributing point. The plant consists of two main buildings 227 by 65 feet, with a total floor space of 32,000 square feet.

## The Automobile Calendar—Shows, Meetings, Etc.

Jan. 2-10.....New York City, Importers' Automobile Show, Hotel Astor.	Jan. 24-31.....Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.	Feb. 21.....Santa Monica, Cal., Vanderbilt Cup Race.
Jan. 3-10.....New York City, Automobile Show, Grand Central Palace.	Jan. 26-31.....Scranton, Pa., Automobile Show, Automobile Assn. of Scranton.	Feb. 21-28.....Newark, N. J., Automobile Show, N. J. Auto Trade Assn.
Jan. 4-8.....New York City, Meeting S. A. E.	Jan. 31-Feb. 7.....Minneapolis, Minn., Automobile Show.	Feb. 21-28.....Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Jan. 5-10.....Los Angeles, Cal., Automobile Show, Grand Avenue Pavillion.	Feb. ....Hartford, Conn., Show.	Feb. 23.....Santa Monica, Cal., American Grand Prix.
Jan. 10-16.....Milwaukee, Wis., Sixth Annual Show, Auditorium, Milwaukee Automobile Dealers' Assn.	Feb. ....St. Louis, Mo., Show.	Feb. 23-28.....Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Jan. 10-17.....Cleveland, O., Automobile Show, Wignmore Coliseum, Cleveland Automobile Show Co.	Feb. 2-7.....Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.	Feb. 24-28.....Syracuse, N. Y., Automobile Show, State Armory, Syracuse Automobile Dealers' Assn.
Jan. 10-17.....Philadelphia, Pa., Show Metropolitan Building, Automobile Trade Assn., H. W. Terry, Secretary.	Feb. 3-7.....Kalamazoo, Mich., Show.	Mar. 2-4.....Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
Jan. 10-21.....Brussels, Belgium, Salon de l'Automobile du Cycle et des Sports; Chambre Syndicale de l'Automobile et du Cycle de Belgique.	Feb. 3-7.....Montreal, Que., Motor Truck Show, Montreal Automobile Trade Assn.	Mar. 2-6.....Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
Jan. 12-17.....Bridgeport, Conn., Annual Automobile Show, State Armory, B. B. Steiber, manager.	Feb. 4-7.....St. Joseph, Mo., Annual Show, St. Joseph Auditorium, St. Joseph Automobile Show Assn.	Mar. 7-14.....Hamilton, Ont., Passenger and Truck Show.
Jan. 14-21.....St. John, N. B., Maritime Automobile Show, New Brunswick Automobile Assn.	Feb. 7-12.....Seattle, Wash., Annual Automobile Show, State Armory Bldg., W. I. Fitzgerald, Manager.	Mar. 7-14.....Boston, Mass., Automobile Show.
Jan. 17-24.....Detroit, Mich., Automobile Show.	Feb. 9-14.....Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.	Mar. 9-14.....Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
Jan. 17-24.....Pittsburgh, Pa., Annual Automobile Show, Automobile Dealers' Assn.	Feb. 9-14.....Buffalo, N. Y., Commercial Car Show, Buffalo Automobile Dealers' Assn.	Mar. 17-21.....Boston, Mass., Truck Show.
Jan. 19-24.....Washington, D. C., Automobile Show, Convention Hall, Washington Automobile Dealers' Assn.	Feb. 9-14.....Grand Rapids, Mich., Fifth Annual Western Michigan Show, Klingman Furniture Exposition Bldg., Grand Rapids Herald.	Apr. 9-15.....Manchester, N. H., Automobile Show.
Jan. 24-31.....Montreal, Que., Automobile Show, Passenger Cars, Montreal Automobile Trade Assn.	Feb. 9-14.....Portland, Me., Second Annual Show, Dealers' Assn.	May 30.....Indianapolis, Ind., 500-mile Race, Indianapolis Motor Speedway.
Jan. 24-31.....Rochester, N. Y., Automobile Show, Exposition Park Rochester Automobile Dealers' Assn.	Feb. 11-14.....Geneva, N. Y., Automobile Show, State Armory.	July 3-4.....Tacoma, Wash., Road Races, Tacoma Carnival Assn.
	Feb. 14-21.....Pittsburgh, Pa., Automobile Show, Pittsburgh Auto Show Assn.	July 4.....Sioux City, Iowa, 300 Mile Race, Sioux City Auto Club and Speedway Assn.
	Feb. 16-21.....Kansas City, Mo., Auto Show.	July 4.....Lyons, France, French Grand Prix.
	Feb. 16-21.....Toronto, Ont., Automobile Show, E. M. Wilcox.	July 13-14.....Seattle, Wash., Track Races, Seattle Speedway Assn.
	Feb. 17-21.....Salt Lake City, Utah, Automobile Show, W. D. Rishel.	July 25-26.....Belgium Grand Prix Road Races.
	Feb. 18-21.....Bloomington, Ill., Automobile Show, McLean County Automobile Club.	Aug. 28-29.....Chicago, Ill., Elgin Road Races, Chicago Automobile Club.
		Sept. 9.....Corona, Cal., Road Race, Corona Auto Assn.
		November .....El Paso, Tex., Phoenix Road Race, El Paso Auto Club.





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of your car,

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# The Week in the Industry

## Motor Men in New Roles

**HOYT Moves to Staunton**—Francis R. Hoyt, consulting engineer, of Cleveland, O., has removed his offices from that city to Staunton, Va., in order to be in intimate touch with the early production of the Falcon cyclecar, of which he is the designer. The Falcon Cyclecar Co. is now erecting machinery in its new plant at Staunton, and will be under quantity production by February 15.

**Esterly Heads U. S. Tire**—H. E. Esterly has been placed in charge of the United States Tire Co.'s branch in Oakland, Cal.

**Jones Auburn Manager**—H. O. Jones has recently been appointed San Francisco, Cal., sales manager of the Auburn Sales Company.

**Ames Divine Tire Manager**—C. E. Ames has become general sales manager of the Divine Tire Co., Utica, N. Y. His headquarters will be in Chicago.

**Atwater Joins Century Rubber**—George S. Atwater, of Boston, has accepted a position as sales manager of the Century Rubber Co., Plainfield, N. J.

**Bennett Heads Syracuse Supply Co.**—L. W. Bennett has become affiliated with the Syracuse Auto Supply Co., Syracuse, N. Y. He has been officially elected president and general manager of the company.

**Sanders with Wagenhals Motor**—L. B. Sanders has become sales manager of the Wagenhals Motor Co., Detroit, Mich. He was formerly with the Abbott Motor Co.

**Ilg with Wichita Falls Truck**—W. H. Ilg, formerly sales and advertising manager of the Schacht Motor Car Co., Cincinnati, O., has taken a similar position with the Wichita Falls Motor Co., Wichita Falls, Tex.

**Dippel Returns to Seattle**—C. G. Dippel, formerly manager for Chanclor & Lyon, accessory dealers in Spokane, Wash., has recently returned to Seattle, and is at present with this company in the Queen City.

**Lufkin with Pierce-Arrow**—O. H. Lufkin, until recently a member of the sales force of the White Motor Car Co., of Boston, Mass., is now connected with the J. W. Maguire Co., of Boston, agent for the Pierce-Arrow.

**Mayo Goes to Packard**—Harry Mayo, who was formerly with the Peerless and Pierce-Arrow companies in Boston, Mass., has just accepted a position with the sales force of the Alvan T. Fuller Co., to sell Packards.

**Carnahan Goes with Vulcan Tire**—A. T. Carnahan has become representative of the Vulcan Tire & Rubber Co., Erie, Pa., for the New York district. He was formerly with the Firestone Tire & Rubber Co., Akron, O.

**Mason Henderson Manager**—Norris N. Mason, formerly American representative of the Renault cars, has re-

signed his position to become manager of the Henderson Eastern Motors Co., 1662 Broadway, New York City.

**Ray Harroun, Jr., Killed**—Ray Harroun, Jr., son of the racing driver and inventor of the Harroun kerosene carbureter, was run over by an automobile in Indianapolis, Ind., receiving injuries from which he died two hours later.

**Baird Joins General Motors**—J. E. Baird has become advertising manager of the General Motors Truck Co., Pontiac, Mich. He comes to this concern from the Kingman Plow Co., Peoria, Ill., of which he was the advertising manager.

**Purnell Jeffery Assistant Manager**—J. Ritchie Purnell, of Kenosha, Wis., has been appointed assistant sales manager of the Thos. B. Jeffery Co., Kenosha, Wis., in charge of detail sales work and manager of the factory used car department.

**Franklin in Seattle**—H. H. Franklin, designer and manufacturer of the car bearing his name, was one of the interesting visitors to Seattle, Wash., recently, where he was the guest of W. A. Wicks, proprietor of the Franklin-Wicks Co.

**Sackett Goes to Springfield**—Louis J. Sackett, for a long time a member of the Boston sales force of the Jackson Motor Car Co., resigned recently to accept a position as manager of the McKee Automobile Co. of Springfield, Mass., agent for several cars and trucks.

**Flanders to Miami for Rest**—W. E. Flanders, president of the Maxwell Motor Co., Detroit, Mich., recently departed for his winter home in Miami, Fla., where he will take a much-needed vacation. He will, however, be back in time for the New York show.

**Danforth Makes a Change**—A. L. Danforth, for some years with the Alvan T. Fuller Co., of Boston, agents for the Packard, resigned recently to accept a position as manager of the retail department of the Cadillac Automobile Co., of Boston. His position at the Packard has been filled by J. L. Quimby.

**Steenstrup to South America for Hup**—P. S. Steenstrup, former sales manager of the Hyatt Roller Bearing Co., New York City, has been appointed special representative to South America for the Hupp Motor Car Co., Detroit, Mich. He will sail from New York January 15, and will make his headquarters in Buenos Ayres.

**Is on Board of Public Safety**—Mayor Harry R. Wallace, of Indianapolis, Ind., has recently appointed Hugh M. Love to the Board of Public Safety, which has control of the police and fire departments. Mr. Love is a director in the Waverley Co. and has been active in the affairs of the Indiana Automobile Manufacturers' Association.

**Elect Officers in Indiana Association**—The Indianapolis Automobile Trade Association has elected the following officers for 1914: President, Frank L. Moore; vice-president, Herbert Hatton

Rice; secretary, F. Ellis Hunter; treasurer, Fred I. Willis; directors, George A. Weidley, Harry L. Archey, Bruce M. Wylie, Leslie L. Banford and R. P. Henderson.

**Golder Milwaukee Kissel Manager**—Clifford E. Golder, formerly president and general manager of the Curtis Automobile Co., Milwaukee, Wis., distributor for the Reo, has been appointed manager of the commercial vehicle department of the Milwaukee branch of the Kissel-Kar. Mr. Golder served as president of the Milwaukee Automobile Dealers' Association for two terms.

**Higgins Resigns**—After nearly nine years' connection with the John Millen & Son, Ltd., R. S. Higgins, of Montreal, Que., has tendered his resignation to form a partnership with James F. Lee, of the Ontario Motor Supply Co., Toronto, for the establishment of a distributing station in Montreal for Firestone tires. The Quebec headquarters will be located at 21 Phillips Square, Montreal, and will be known as the Higgins & Lee Motor Tire Co.

## Garage and Dealers' Field

**Kaiser's Cars Bijur Equipped**—Two new automobiles being built for the Kaiser by a German manufacturer will be equipped with Bijur lighting and starting systems operated from Willard storage batteries, which are made in Cleveland, O.

**Perfection Spring Establishing Stations**—The opening of a service station at Euclid avenue and East 65th street by the Perfection Spring Co., Cleveland, O., is a forerunner of other stations the company will operate elsewhere, notably New York and Chicago. Springs of every make car are repaired or replaced at these stations.

**New Victoria Bus Line**—A motor bus company has been formed in Victoria, B. C., in which every citizen may be a shareholder, the stock selling for \$1 per share. Fares of from 2 to 5 cents may be charged. A number of business men are back of the proposition, the reason for its existence being increased street car fares. The company will be capitalized at \$50,000, with the shares having a par value of \$1.

**Truffault-Hartford's New Buildings**—To provide for greater facilities for distributing Truffault-Hartford shock absorbers, jacks and bumpers, the Hartford Suspension Co., Jersey City, N. J., has taken the new building at 425 North Capitol Boulevard as a new location for its Indianapolis, Ind., branch, the former quarters having been at 448-450 North Capitol Boulevard. The new place was built especially for the Truffault-Hartford concern, whose Indianapolis interests are cared for by S. C. Bohannon. On January 1 the Kansas City (Mo.) branch of the Hartford Suspension Co. will be moved from 1524 to 1803 Grand avenue. Henry Roemer is in charge of the Kansas City district.